Manitoba

Annual Report 1984 - 85

Energy and Mines

Manitoba

Minister of
Energy and Mines

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Legislative Building
Winnipeg, Manitoba, CANADA
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The Honourable Pearl McGonigal
Lieutenant Governor of the Province of Manitoba

May it please your Honour:

I have the honour of presenting to you the Annual Report of the Department of Energy and Mines for the fiscal year ending March 31, 1985.

This report records the activities of the Department and the performance of the mineral resources and energy industries of the province during the year.

Wilson Parasiuk

Wilson Parasiuk,
Minister

Manitoba

Deputy Minister of
Energy and Mines

Room 301
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The Honourable Wilson Parasiuk
Minister of Energy and Mines

Dear Sir:

I have the honour to present the Annual Report of the Department of Energy and Mines for the fiscal year ending March 31, 1985. The report contains a descriptive and statistical record of activities and achievements in the mineral and energy sectors during the year.

Charles Kang,
Deputy Minister

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Manitoba Energy and Mines

Manitoba is endowed with mineral and energy resources. The responsibility for the disposition of these resources rests with the Department of Energy and Mines.

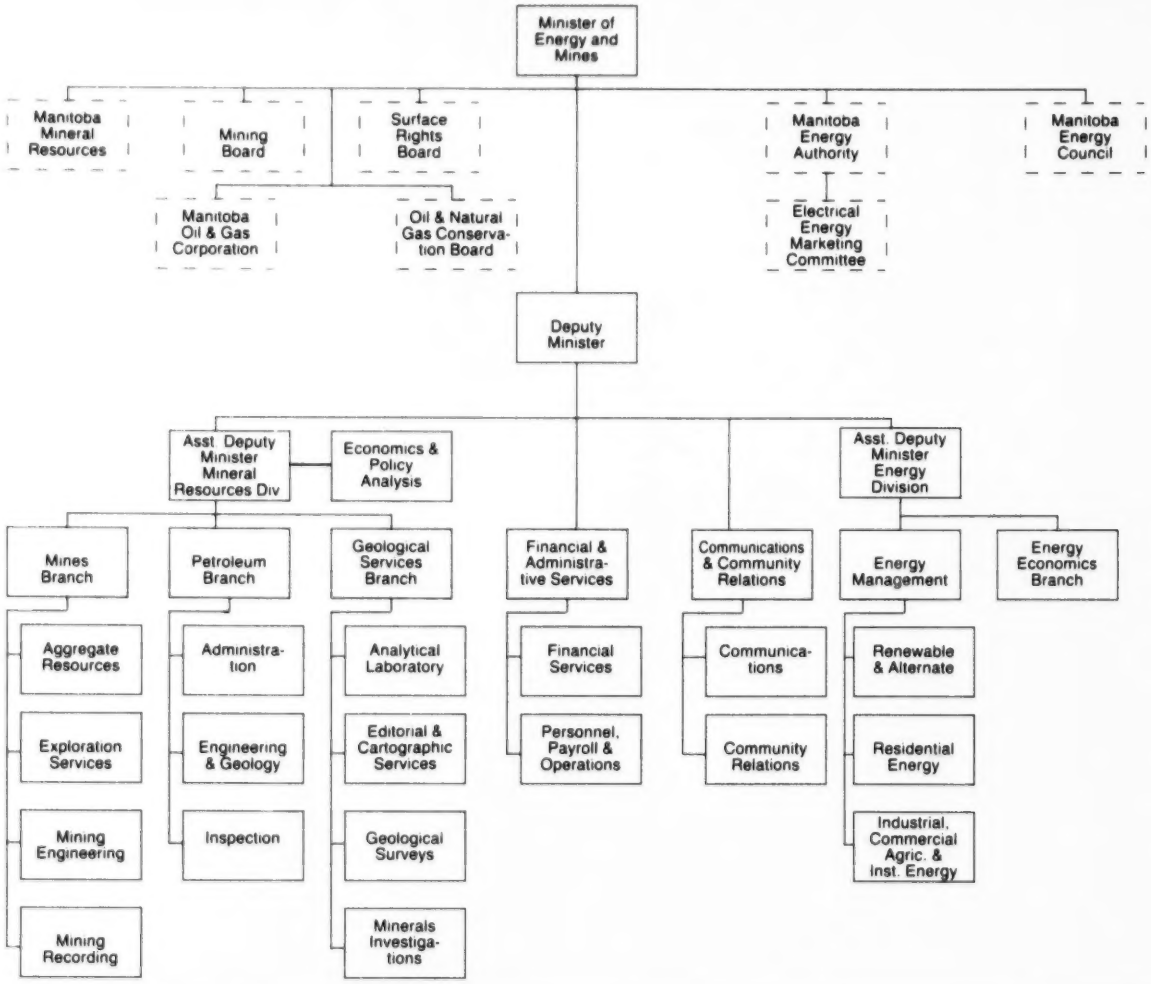
The goal of the Department is to ensure that the mineral and energy endowment of the Province is developed and managed responsibly to provide continuing benefits to the people of Manitoba.

The Department's management of these resources must be cognizant of and responsive to the public interest, the role of industry in translating the resources into tangible benefits for Manitobans, and the complementary endeavours of the Federal Government. On-going liaison between industry, the Federal Government and the Province is required for responsible resource management.

During the year these functions were carried out by two main Divisions, the Mineral Resources Division and the Energy Division, with support from Financial and Administrative Services and Communications and Community Relations. Additionally, the Minister held responsibility for the following Crown Corporations and Boards: Manitoba Mineral Resources, Manitoba Oil and Gas Corporation, The Mining Board, The Surface Rights Board, The Oil and Natural Gas Conservation Board, Manitoba Energy Authority and Manitoba Energy Council.

A summary of expenditures of the Department for the year ending March 31, 1984 is given in Table 1.

Organization Chart — Manitoba Energy and Mines



Mineral Resources Division

The Mineral Resources Division is responsible for the administration of the provincial Mines Act and Regulations governing the exploration, development and production of provincial mineral resources and the safety and health of the employees in mining, smelting and refining operations; for the conduct of geological investigations directed towards providing a data base for mineral resource exploration, evaluation and development; and for monitoring the effect of provincial mineral policy on the mining and petroleum industries in the Province.

Economic and Policy Analysis

The function of this Section is to undertake analysis and evaluation of the economic and policy impact of provincial, national and international mineral developments on the provincial mineral industry, and to assist in policy development and implementation. Studies conducted by the section contribute to effective management of the provincial mineral resources and the maintenance of appropriate and effective mineral and mineral tax policies.

The Section is responsible for the collection and analysis of provincial mining statistics. This function is carried out both by direct provincial surveys of mine and mill production, and through agreements with the Federal Department of Energy, Mines and Resources and Statistics Canada, by undertaking on behalf of these agencies surveys of Manitoba mining and exploration companies. A survey of exploration companies active in the Province is conducted by the Section in December of each year to provide an estimate of exploration expenditures in the current year and a forecast for the forthcoming year.

Revenue from mining and quarrying collected under the provisions of The Mines Act, The Mining Royalty and Tax Act, and The Mining Tax Act for the fiscal year 1984/85 was $10,764,650 compared with $35,829,952 for the previous year (see Table 2).

Staff of the Section assisted in the negotiation of the Canada-Manitoba Mineral Development Agreement which was formally signed in the spring of 1984. The Agreement is for a 5-year term (1984-89) with the Federal Government contributing $14.8 million and the Provincial Government $9.9 million. The Section is responsible for activities in Sector C of the Agreement, Development and Marketing Studies. Studies conducted during the year in the Sector focussed on Manitoba's copper-zinc sector and the Province's industrial minerals sector.

Staff of the Section undertook and/or participated in various studies pertaining to the cyclical and structural difficulties facing Manitoba's mining industry and single industry communities, such as Lynn Lake, Leaf Rapids, Flin Flon and Snow Lake.

Staff also participated in feasibility and taxation studies to promote the development of potash mining and processing in the Russell-Binscarth area of southwestern Manitoba.

Mines Branch

The Mines Branch, through the activities of its component sections, is responsible for administration of matters relating to the operation of mines, smelting and refining operations; recording of mineral dispositions; monitoring exploration activities and reviewing assessment reports; the rehabilitation of mining lands; aggregate resource inventory studies; and the implementation of provincial land use policy concerned with the conservation of aggregate resources.

Mining Recording Section

The Mining Recording Section maintains recording offices in Winnipeg and The Pas to administer regulations under The Mines Act governing the disposition of Crown mineral rights other than oil and natural gas. The regulations enable individuals and companies to acquire claims, permits and leases for the right to prospect, develop and mine Crown minerals. The Mining Recorders and their staff process applications for these mineral dispositions; monitor and inspect the activities of disposition holders; collect fees, rent, royalties and refundable performance deposits; maintain records; and deal with enquiries relating to these functions.

During calendar year 1984, 1,112 mining claims were recorded covering a total area of 201 058 hectares, compared with 173 055 hectares in 1983. Mineral dispositions in good standing at the end of 1984 are given in Table 3. Details of Crown mineral dispositions issued during 1984 are given in Table 4.

Total revenue collected by the Section during the fiscal year was $1,547,783, comprising $917,021 from dispositions, other fees and rentals; $76,410 from The Mining Claim Lease Tax; and $554,352 from royalties on industrial minerals (see Table 2).

There was an increase in royalties from industrial minerals production ($554,352 in 1984/85 compared with $373,230 in 1983/84) reflecting an increase in activity in the construction industry.

Aggregate Resources Section

The Aggregate Resources Section undertakes detailed surficial geological mapping, aggregate resource inventories and prepares quarry mineral land use recommendations based upon provincial land use policies. Resource inventory data and resource management proposals are provided to government, municipalities and private sector users.

Economic evaluations of sand and gravel deposits were undertaken by staff geologists in the Rural Municipalities of Miniota and Wallace, the Local Government Districts of Reynolds and the southern portion of Grahamdale. Mapping of surficial geology and an aggregate resource inventory of the Rural Municipality of Victoria were conducted by Underwood McLellan Limited under contract to the Mines Branch.

In response to requests from Municipal Planning Districts, recommendations for the protection of quarry mineral resources were presented to the Rural Municipality of Tache, the Rural Municipality of Lac du Bonnet and the Local Government District of Alexander. The mineral resource planning recommendations were supported by technical background reports and maps illustrating the proposed planning status of each economic quarry mineral deposit. One presentation was made at a municipal council meeting concerning the protection of quarry mineral resources. A total of 1,276 land subdivisions were reviewed of which 48 subdivisions conflicted with mineral extraction and development and required detailed evaluation by staff geologists. All proposed Crown land transfers and zoning by-law amendments were reviewed and, where necessary, recommendations made to minimize potential conflicts with mineral extraction. Staff geologists maintain representation on all Regional Land Use Committees and serve on a variety of technical advisory review committees.

One aggregate report, three multicolor Quarternary geological maps of southern Manitoba, three internal resource management reports prepared for municipal councils, were released during the year. Publications, preliminary maps and presentations by Section staff are listed in Tables 10 and 11.

Exploration Services Section

The Exploration Services Section provides support services to mining companies and prospectors engaged in mineral exploration in Manitoba. The Section reviews assessment work on mineral dispositions for compliance with the requirements of regulations under The Mines Act and disseminates non-confidential data; distributes geological publications; collects and stores diamond drill core; compiles and disseminates exploration and mineral deposit data; monitors, promotes and documents exploration activity in the Province; prepares interpretative geophysical maps of active exploration areas; compiles bibliographies and indexes of Manitoba geology; and undertakes land-use, mineral potential (capability) studies.

During the fiscal year, 194 reports of exploration work were received and assessed; 756 files were microfilmed; 75 reports were added to the non-confidential files; 787 files were reproduced for the private mining sector; 1,538 open files were examined by mining industry personnel, 1,630 by Divisional staff, and 278 visits were made by mining company personnel. The master "Index to Non-confidential Assessment Reports", complied from the CLASS computer file of exploration data, was updated and supplements were issued in May and November. Index maps showing the areal extent of non-confidential exploration work were updated.

During the year 1,017 orders for geological publications and maps were filled, generating $11,651.08 in revenue. Publication release notices for ten new publications were mailed to the 600 addresses on the mailing list. Sixty orders for over 400 mineral inventory cards and over 100 corporation files were filled.

A total of 25 828 metres of core was collected from 19 sites during the year under the diamond drill core acquisition and storage program. As of March 31, 1985, the Province's drill core inventory was 180 838 metres, stored at four regional core libraries — Lynn Lake (33 296 metres), The Pas (69 629 metres), Thompson (49 902 metres) and Winnipeg (28 011 metres). Core is provided on a voluntary basis by mineral exploration companies and prospectors who, in turn, receive assessment work credits for the transportation costs. The non-confidential core is available for examination, thereby eliminating the need for costly duplication of diamond drilling, and allowing for more productive use of exploration dollars. There were 38 inspection visits at the core libraries during the year and 12 enquiries.

A major accomplishment during the year was the completion of construction of a new core library in The Pas, on time and budget. This has expanded storage capacity for the Flin Flon belt by 300 percent.

Exploration activity summaries were compiled for the Northern Miner and the Annual Prospectors and Developers Association Meeting. Displays depicting the work of the Section, the Geological Branch, and mineral exploration in the Province were presented at the Division's Annual Meeting with Industry, the Prospectors and Developers Association's Annual Meeting in Toronto, the Manitoba Schools Careers Symposium and the Brandon Science Fair.

The Section's geophysicist published Open File 84-2, an interpretation of Gradiometer Surveys in the Flin Flon mining district. He also advised on magnetic susceptibility studies, downhole geophysical surveys and scout drilling in the Flin Flon belt.

A start was made on new bibliographies and indexes to Manitoba geology.

The drill core, gradiometer, bibliographies and inventory projects now come under the Canada-Manitoba Mineral Development Agreement 1984-89.

The Section is responsible for examining land-use requests in order to avoid future conflicts in areas of high metallic mineral potential. Mineral potential (capability) maps were prepared in response to specific requests and staff served on land-use committees.

Mining Engineering

As of April 1, 1984 responsibility for the safety and health of workers at mines was transferred to the Workplace Safety and Health Division of the Department of Environment and Workplace Safety and Health. As part of the transfer, the District Mining Engineers located in Flin Flon and Thompson and the Mines Inspectors located in Thompson, Flin Flon, Snow Lake and Leaf Rapids plus three members of the Winnipeg staff were also transferred to Workplace Safety and Health.

The revision of the Regulation Governing the Operation of Mines was completed in October, 1984 and was given to Workplace Safety and Health that it might be adopted under the Workplace Safety and Health Act. Until such time as the new regulation is in effect, the present regulation under the Mines Act continues to be administered by the inspectorate.

Visits were made on a regular basis to the underground mines in order to monitor their operation.

During the year 572 Casual Permits for Removal of Crown Quarry Minerals were issued. In addition, technical advice was provided to the industry in promoting good mining and rehabilitation practices.

During the year the section became responsible for the Mining and Minerals Technology Research and Development segment of the Canada/Manitoba Mineral Development Agreement. This activity represents a new initiative in federal/provincial cooperative programs specifically designed to strengthen and diversify the Province's mineral resource base.

During 1984/85, programs were initiated on mine safety and productivity, mining technology, mineral processing technology and sulphide tailings.

The Mining Industry

Mineral Production

The value of mineral production, including metals, industrial minerals and fuels, for the 1984 calendar year was $816.8 million compared to $711.3 million for 1983, an increase of 14.8% (See Tables 5 and 6 in Statistical Supplement).

At $540.9 million (up 14.8%), metals accounted for 66.2% of the total value of Manitoba's 1984 mineral production. The value of the more significant metals produced during 1984 were: nickel $275.2 million (up 33.0%); copper $127.8 million (down 8.9%); zinc $68.4 million (up 22.0%); gold $32.3 million (down 12.0%); silver $12.4 million (down 17.3%).

Mining and Processing Operations

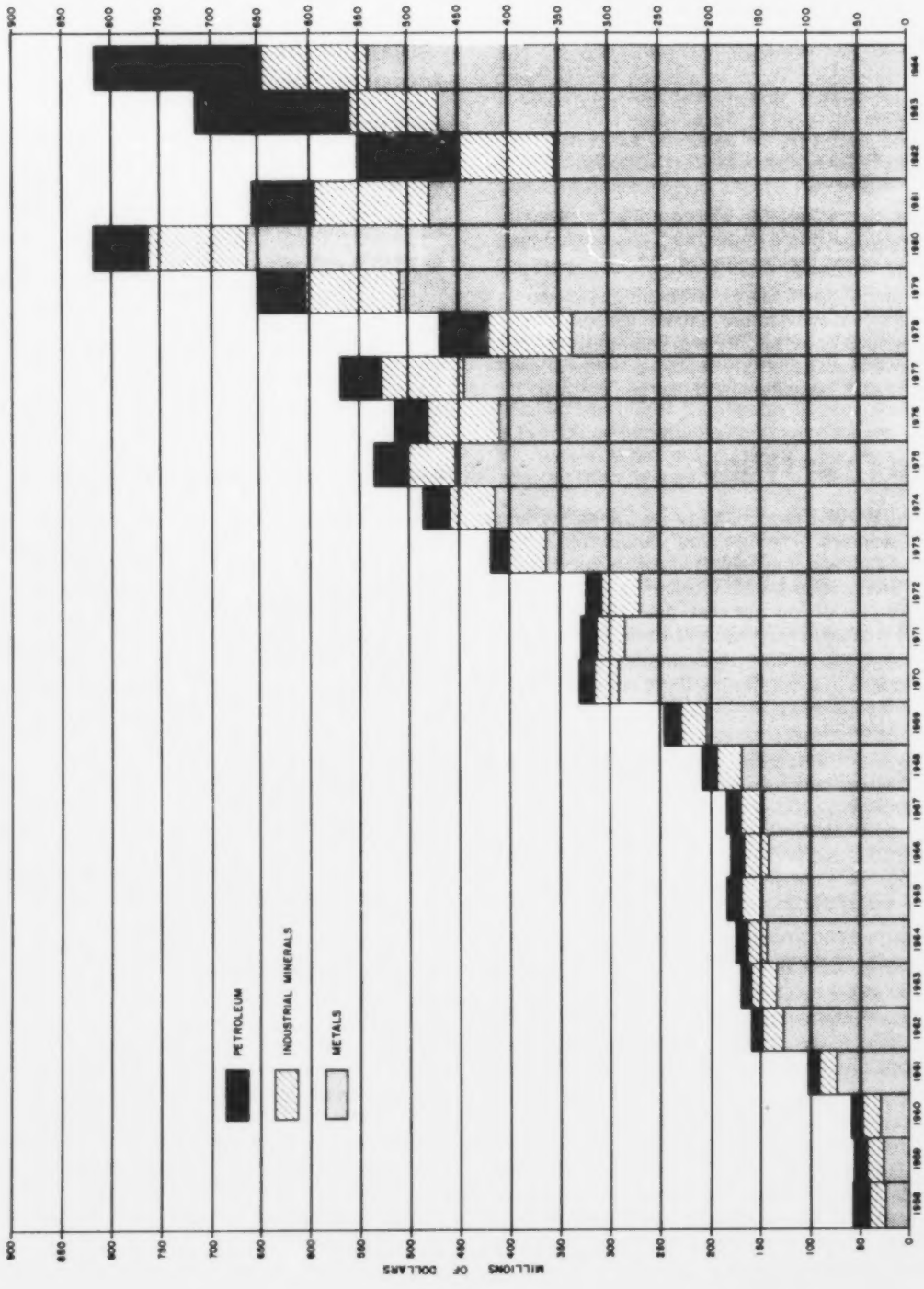
Metallic Minerals

Mining operations in Manitoba are located in the Flin Flon-Snow Lake area, the Lynn Lake-Leaf Rapids area, and at Thompson, Bernic Lake and Bissett (see Map 1).

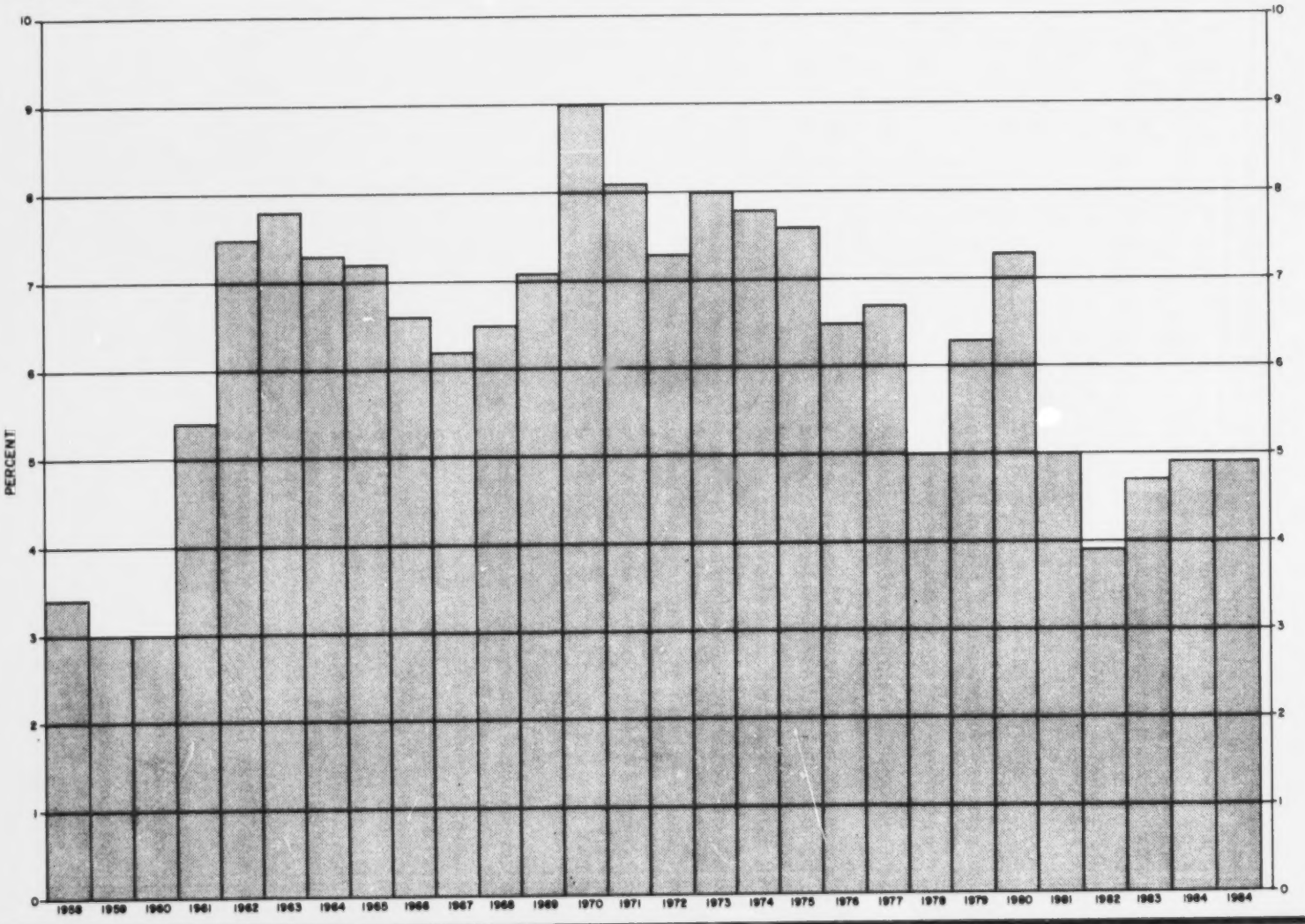
Hudson Bay Mining and Smelting Co., Limited operated a number of mines in the Flin Flon-Snow Lake area, concentrators at Flin Flon and Snow Lake, and smelting (copper) and refining (zinc and cadmium) facilities at Flin Flon. Besides treating ores from the company's own mines, concentrates from the Fox and Ruttan mines of Sherritt Gordon Mines Limited and the Trout Lake Joint Venture are also processed at Flin Flon. The main products from the complex are anode copper, refined zinc, refined cadmium and lead concentrate. At the end of 1984, approximately 1,800 people were employed at the company's mines and processing facilities in Manitoba. (An additional 420 people were employed at company operations on the Saskatchewan side of the border).

In the Snow Lake area, the company operated five mines. The 3 447 tonne per day concentrator at Stall Lake, inaugurated in June 1979, produces copper and zinc concentrates which are shipped to Flin Flon for further processing, and a lead concentrate which is shipped to Trail, B.C. The *Chisel Lake*, *Ghost Lake*, *Stall Lake*, *Anderson Lake* and *Spruce Point* mines operated continuously, while the *Rod Mine* was brought into production in March 1984. The *Osborne Lake Mine*, which ceased production in the fall of 1983, was permanently closed during 1984.

In the Flin Flon area, operations continued at the *Westarm*, and *Flin Flon* mines. The *Trout Lake Mine*, operated under a joint venture agreement (Hudson Bay Mining and Smelting Co., Limited 44%, Scandanavian

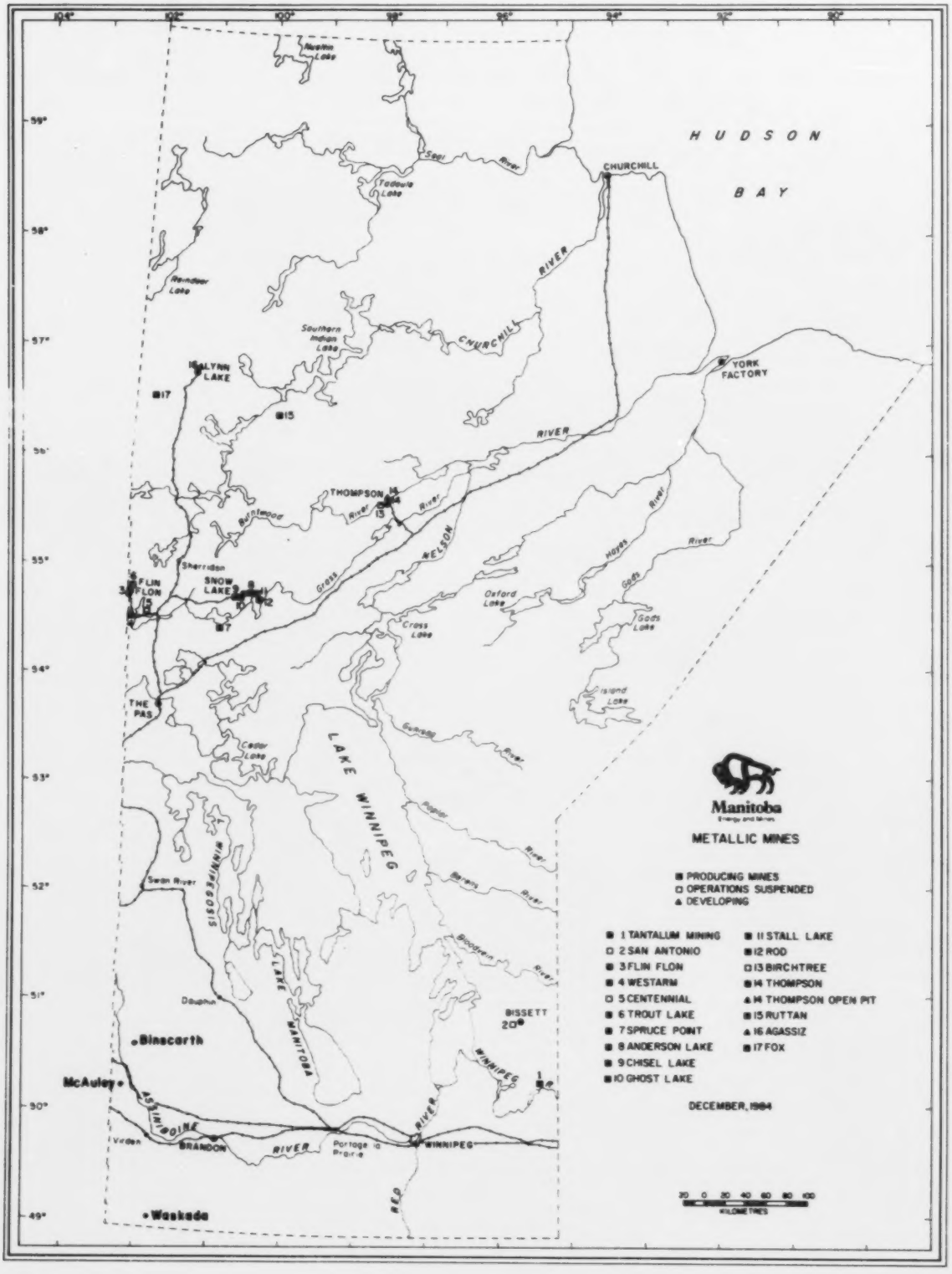

PETROLEUM
INDUSTRIAL MINERALS
METALS
MILLIONS OF DOLLARS

Manitoba's Mineral Production as a Percentage of the Gross Provincial Product 1958-1984



Map 1

Location of Metallic Mines



Minerals Syndicate 29%, and Manitoba Mineral Resources Ltd. 27%), produced at the scheduled capacity of 1 633 tonnes per day. During 1984, the *Centennial Mine* was maintained on a standby basis, with production scheduled to be resumed in 1985.

Inco Limited operated two mines, a concentrator, smelter and nickel refinery at Thompson. Ore production during 1984 came from the *Thompson Mine* and *Pipe #2 Open Pit*. However, production from the latter ceased in the fall of 1984 as the pit had reached its economic depth. The *Birchtree Mine* continued to be maintained on a standby basis. The main product from the Thompson complex is electrolytic nickel. By-products include copper matte, cobalt oxide and pentlandite concentrate. Copper matte is shipped to the company's refinery at Copper Cliff, Ontario, while commercial grade cobalt oxide is shipped to the company's refinery at Clydach, Wales, where refined cobalt oxides and salts are produced. Pentlandite concentrates are sold as feed for Sherritt Gordon's nickel refinery at Fort Saskatchewan, Alberta.

During 1984, Inco's smelting and refining operations at Thompson began receiving and processing nickel concentrates from the company's mine at Shebandowan, Ontario. Shebandowan feed is processed at Thompson as a result of investment in facilities connected with full scale smelting tests conducted at Thompson in 1981 and 1982.

In addition, a significant change in product mix at Inco's Manitoba Division occurred during the fourth quarter of 1984 with the production of nickel rounds (electrolytic nickel pellets).

An average of 2,100 persons were employed at the company's Manitoba operations during 1984.

In October 1981, Inco had announced the development of an open pit at Thompson to replace the Pipe Open Pit. The development of the first phase of the project at an estimated cost of $87-$90 million was deferred in July, 1982 for one year due to depressed nickel market conditions. The first phase of development, which includes the removal of 2.0 million cubic metres of overburden, will permit mining of a portion of the Thompson ore body to a depth of 122 metres. Dredging resumed in August 1983 and is scheduled to continue until mid-1985. Production from the first phase is to commence early in 1986. The development of the Thompson open pit will provide production flexibility at Thompson and help reduce costs.

Sherritt Gordon Mines Limited operated two mines and concentrators in the Lynn Lake-Leaf Rapids area.

Production at the *Fox Mine*, located 48 kilometres southwest of Lynn Lake, commenced in 1970. Mining is from blast-hole stopes with an adaptation of this method for pillar recovery. Ore below the 2000 level, the lowest level serviced by the shaft, is developed by a ramp which extends to the 2800 level. To facilitate hoisting of ore from this area, a 2.4 metre diameter borehole was equipped for hoisting ore to the 2000 level. The concentrator at this mine produces copper and zinc concentrates which are trucked to load-out facilities at Lynn Lake for rail shipment to Flin Flon for further processing. The Fox Mine is scheduled to close in the fall of 1985, when ore reserves will have been depleted.

The *Ruttan Mine*, located 96 kilometres southeast of Lynn Lake, commenced production in 1973 from an open pit. In 1974, development of the underground mine was initiated with a decline and conveyorway. The decline was extended to the 1400 level and a service shaft sunk to the 1000 level. In 1980 this shaft was extended to the 2230 level to permit detailed subsurface drilling of the downward extension of the orebodies.

Further deepening of the shaft to the 3000 level was started in August 1983 and was essentially completed by March 1984. The deepening of the shaft will permit Sherritt to carry out a deep drilling exploration program below the 2600 level, in addition to allowing for development and mining of the Ruttan orebody between the 1400 and 2600 levels. In March 1984, Sherritt's Board of Directors authorized a $28 million development program between the 1900 and 2600 level, with the Provincial Government providing a loan of $10 million and the balance furnished in the form of a term-loan facility by a Canadian chartered bank. Exploration from the 2800 level is being carried out to further delineate the downward extension of the main orebody.

Copper and zinc concentrates produced by the mill are trucked to Lynn Lake for rail shipment to Flin Flon where both zinc and copper concentrates are treated.

At December 31, 1984, ore reserves at the Ruttan Mine, included in current mine plans, were estimated at 14.6 million tonnes grading 1.68% copper and 1.20% zinc. Approximately one third of these reserves lie in the area of the mine above the 1400 level, with the remainder located between the 1400 and 2600 levels. The ore zone is open at depth.

Tantalum Mining Corporation of Canada Limited (TANCO)

The tantalum operations of Tanco remained shutdown during 1984 as high inventories of tantalite and poor market conditions continued.

In 1984, Tanco, with financial assistance from the Federal Government and by modifying the existing tantalum mill, established a pilot plant to produce a high quality, low iron, spodumene concentrate which can be used directly in the manufacture of such items as corning ware and similar competitive end products.

Ore reserves remain unchanged at 981 000 tonnes of tantalite ore with a drill indicated grade of 0.138% Ta_2O_5 and 637 000 tonnes of stored tailings grading 0.065% Ta_2O_5. Lithium and cesium ore reserves are reported as 7 031 000 tonnes grading 1.76% LiO_2 and 272 000 tonnes grading 23% Cs_2O, respectively.

Precious Metals

Agassiz Deposit

In 1979, Sherritt Gordon Mines Limited acquired an option on the Agassiz gold deposit from Comiesa Corporation, a wholly owned subsidiary of Agassiz Resources Ltd. Since 1979, Sherritt Gordon has carried out exploration and development activities, including diamond drilling, shaft deepening and drift development.

From August 12, 1983 to August 31, 1984, exploration and development activities were jointly funded by the Federal and Provincial Governments and Sherritt Gordon under the NEED program. In October 1984, Sherritt's Board of Directors approved the expenditure of a further $6.9 million on the project, although a production decision had not been made as of the end of 1984.

San Antonio

In August 1980, *Brinco Mining Ltd.* and *New Forty-Four Mines Limited* signed a joint venture agreement to reactivate the San Antonio gold mine in Bissett. The former operation, which initially began production in 1932, had been dormant since 1968 when a fire destroyed the hoistroom. The mine is developed by a shaft and three winzes to a total depth of 1 518 metres.

In 1982, the original joint-venture arrangement between Brinco and New Forty-Four Mines Ltd. was renegotiated. Under the new arrangements, Brinco's interest in the mine was increased from 50% to 100% with New Forty-Four Mines Ltd. retaining a 10% net profits interest, payable after Brinco had recovered its costs associated with development and operation of the mine.

The mine was operated during 1982 and until May 1983 when production was suspended. In June 1983, an exploratory drilling program was carried out by Brinco following which all operations were terminated.

In January 1984, *Lathwell Resources Ltd.* concluded an agreement with Brinco for the exploration and development of the mine, whereby Lathwell could earn a working interest in the assets of the mine. However, Lathwell failed to meet the requirement of the agreement of having to spend a specified amount during the first year and thus lost its option rights to the property.

Brinco is attempting to interest other mining companies in the property.

Whiteshell Resources Ltd. completed exploration and feasibility studies on its properties near Star Lake in the Whiteshell Park. A detailed development program was submitted for review by the Parks Branch of the Department of Natural Resources. A work permit was issued in February 1984, for a mining operation in the Park with ore to be trucked to a milling site outside the Park boundaries. Financing arrangements are being pursued.

Industrial Minerals/Structural Materials

The production and value of industrial minerals and structural materials for 1984 are given in Table 1 in the Statistical Supplement.

A large face-brick plant at Lockport, near Winnipeg, is operated by Red River Brick and Tile Co., using stoneware *clay* from the Ste. Rose du Lac area, *shale* from the Pembina Mountain area, and *sand* from local sources. The plant supplies bricks for the mid-Canada and central-northern United States markets.

Non-swelling bentonite, used mainly in clarification of petroleum and vegetable oils, is mined by Pembina Mountain Clays Inc. near Morden and shipped to the company's plant in Winnipeg for treatment with sulphuric acid to increase its absorbency. Pembina Mountain is the only producer of non-swelling bentonite in Canada.

Gypsum is produced by Domtar Construction Materials Ltd. at Gypsumville for use in the company's wallboard plant in Winnipeg. Westroc Industries Ltd. also produces gypsum at Harcus near Amaranth for its wallboard plants in Winnipeg and Saskatoon.

Portland Cement production comes from the plant of Genstar Cement Limited at Fort Whyte, using local clay and silica sand and limestone quarried at Steep Rock. Limestone is also quarried north of Mafeking by Genstar, to supply the company's cement plant at Regina. Canada Cement Lafarge Ltd. also produces Portland Cement at its Fort Whyte plant using clinker imported from Alberta.

Steel Brothers Canada Ltd. produces *lime* from kilns at Winnipeg and Faulkner. *Limestone and dolomite* are quarried at Garson by Gillis Quarries Ltd. for *building stone,* and crushed rock is produced by numerous operators in the Interlake region and elsewhere. Cold Spring Granite (Canada) Limited and Shield Quarries operate *granite* quarries in the Lac du Bonnet area primarily for use as building stone. High quality *silica sand,* quarried from Black Island in Lake Winnipeg by Steel Brothers, is exported for use in glass-making, as foundry sand, for sand blasting, and as a filtering medium.

Peat moss is produced from sphagnum bogs in southeastern Manitoba and used in horticulture. Fisons Western Corporation operates four bogs near Moss Spur, Julius and Elma. A fifth bog near Giroux was brought into production in the spring of 1983 by Premier West Peat Moss Ltd. Both companies produce a "value-added" product, combining fertilizer with the peat moss.

In 1984, Canamax Resources Inc. and the Province signed a Letter of Intent to undertake joint and separate feasibility studies on *potash* deposits in the Russell-Binscarth area. Studies include establishing project capital and operating costs, assessing available and potential potash markets and selecting preferred mining and processing technologies.

Canamax estimates that the mineable ore reserves grade over 25% K_2O and that current reserves are sufficient for at least 30 years at an annual production rate of 2 million tonnes of product.

Mineral Exploration

All indicators show a significant increase in exploration activity in Manitoba during 1984. The number of known individual exploration projects completed in the Province increased from 100 in 1983 to 127 in 1984. The preliminary estimate of exploration expenditures in the Province during 1984 is $30.8 million, an increase of 86% from the $16.6 million recorded in 1983. The 1982 figure was $17.1 million. Diamond drilling on surface exploration was approximately 389,000 feet (118 500 metres) in 1984, which is double that for 1983.

The total area of claims recorded in the Province during 1984 increased 16% to 201 058 hectares from 173 055 hectares in 1983. The 1982 figure was 115 702 hectares. Mineral dispositions (which include claims, permits and leases) in good standing at the end of the year totalled 1 226 525 hectares compared with 1 000 526 hectares at the end of 1983 and 1 131 732 hectares at the end of 1982.

As has been the pattern in Manitoba in recent years, base metals and gold dominated the exploration scene, particularly in and around existing mining areas.

Metals

In the *Flin Flon-Snow Lake Belt,* exploration activities included geological, geophysical and diamond drilling programs. The major companies active in this area were Hudson Bay Exploration and Development Company Limited, Granges Exploration Ltd., Falconbridge Limited, BP-Selco Exploration Ltd., Cominco Ltd., Manitoba Mineral Resources Ltd., W. B. Dunlop Ltd., Nor-Acme Gold Mines, Snow Lake Exploration, Ray-Dor Resources Ltd. and local prospectors.

Hudson Bay Exploration was again the most active company in this belt and carried out many small (1 to 3 holes) diamond drilling projects, as well as a number of more detailed drilling programs to further delineate the potential of a number of mineralized zones. Drilling programs were also carried out by Granges Exploration, Falconbridge and BP-Selco Exploration.

In the *Lynn Lake Belt,* exploration included geological mapping, geophysics, geochemistry and diamond drilling. Active companies were Sherritt Gordon Mines Limited, Manitoba Mineral Resources Ltd., and Granges Exploration Ltd.

Base metals exploration projects, which consisted of geological mapping, geochemistry, geophysics and diamond drilling, were undertaken in the more remote belts of *Northern and Central Eastern Manitoba* by Noranda Exploration Company Limited, Westmin Resources Limited, Hudson Bay Exploration and Development Company Limited, and W. B. Dunlop Ltd. In the *Thompson Nickel Belt,* Inco Limited completed geological and geophysical work on selected properties.

In *Southeastern Manitoba,* BP-Selco Exploration Ltd., in joint venture with Manitoba Mineral Resources Ltd., continued exploration in an area to the west of Lake of the Woods. The 1984 program included the drilling of a number of geophysical targets.

Gold

The greenstone belts of Manitoba, which were host to a number of past producing gold mines, were the focus of exploration interest during 1984.

Three projects in the *Flin Flon-Snow Lake Belt* generated a considerable amount of interest and exploration activity. These are Granges Exploration Ltd. (50%) joint venture with Aberford Resources Ltd. (50%) at Tartan Lake east of Flin Flon; the Barrick Resources Corporation (50%) joint venture with Zenco Resources Ltd. (50%) at Squall Lake north of Snow Lake; and the Puffy Lake joint venture of Maverick Mountain Resources Ltd. (60%) and Granges (27%). Diamond drilling on these properties will continue into 1985. Other companies active in this belt were Hudson Bay Exploration and Development Company Limited, Noranda Exploration Company Limited, Dome Exploration (Canada) Limited, Red Earth Energy Limited, W. B. Dunlop Ltd. and Nor-Acme Gold Mines. The work completed included prospecting, geological mapping, geophysics, geochemistry and diamond drilling.

In the *Lynn Lake Belt,* Sherritt Gordon Mines Limited committed an additional $6.9 million for shaft deepening, drifting and underground drilling at the Agassiz deposit during the year. Work on the previous exploration and evaluation phase of this project was undertaken during 1983 under a Federal/Provincial NEED

program. In addition to the Agassiz project, Sherritt Gordon was engaged in a number of gold exploration programs in the Lynn Lake area which included geological mapping, geochemistry and diamond drilling. Manitoba Mineral Resources Ltd. also continued an extensive regional program which included prospecting, geological mapping and diamond drilling. Homestake Mineral Development Company began drilling gold targets on the Beaucage Lake properties optioned from W. B. Dunlop Ltd.

The gold potential of the *Central Eastern Greenstone Belts* attracted a number of companies during the year including BP-Selco Exploration Ltd. at Island Lake, Kennco Exploration (Canada) Limited in joint venture with Claude Resources at Butterfly Lake, Canadian Nickel Company Limited at Oxford Lake, and Westmin Resources Limited in the Utik Lake and Kistigan Lake areas. Junior companies and prospectors active in the Central Eastern region included Midway Lake Minerals Ltd., McChip Resources Inc., J. R. Woodcock Consultants Ltd., Pluton Resources Ltd., Donegal Developments Ltd., and W. B. Dunlop Limited. The work consisted of prospecting, geological mapping, geophysics, geochemistry and some diamond drilling.

The *Rice Lake Belt* and surrounding areas of *Southeastern Manitoba* were quite active for gold exploration, with many junior companies and prospectors participating. Lathwell Resources Limited completed an underground mapping, sampling and diamond drilling program at the San Antonio Mine. Re-evaluation projects were initiated at three former gold producers in the district. These were Highmark Resources Ltd. (50%) joint venture with Homestead Resources Inc. (50%) at the Oro Grande, Reco Gold Mining Limited at the Packsack, and a recent venture at the old Selkirk mine near Bissett. Companies involved in various prospecting, geological, geophysical and diamond drilling programs included Kangeld Resources Ltd., Grande Trunk Resources Inc., BP-Selco Exploration Canada Limited, Canadian Nickel Company Limited, Noranda Exploration Company Ltd., Aberford Resources Ltd., Arbor Resources Inc., Tarron Resources Ltd., Maralgo Mines Ltd., Tulso Resources Limited, H.R.N.D. Mining, Mid-North Resources Ltd., Schmirf Exploration, and a number of local prospectors.

Petroleum Branch

The Petroleum Branch administers provisions under The Mines Act, The Pipe Line Act and The Gas Storage and Allocation Act relating to exploration, development, production and transportation of crude oil and natural gas. In addition, the Branch provides assistance to the Department of Finance in administering The Oil and Natural Gas Tax Act and liaises with The Surface Rights Board on surface rights matters.

One of the major functions of the Branch is to develop, recommend, and administer policies and legislative changes to encourage exploration and development of the Province's crude oil and natural gas resources in an orderly, safe and efficient manner. The Branch also conducts studies and provides technical assistance to The Oil and Natural Gas Conservation Board in matters relating to salt water disposal, enhanced recovery projects, unitization agreements, and other Board responsibilities.

Through the collection and analysis of petroleum industry statistics, and the monitoring of federal-provincial policies, the Branch is able to evaluate the effects of these policies on the petroleum industry and to make recommendations for responsive action by senior management.

The Branch releases a number of reports each year which provide the public, industry and government with information on the performance of the petroleum industry in the Province.

The Branch comprises three Sections: Administration, Engineering and Geology, and Petroleum Inspection. Each section has specific responsibilities relating to the overall function of the Branch.

The *Administration Section* of the Petroleum Branch administers regulations under The Mines Act governing the disposition of Crown oil and natural gas rights in Manitoba and the collection of Crown oil and natural gas royalties. These responsibilities include: conducting sales of Crown leases and exploration reservations; collecting annual rentals; processing renewal and extension applications; and enforcement of other provisions under The Crown Petroleum Leasing Regulations, 1984 and The Crown Petroleum Royalty Regulations, 1984.

The Section also administers the Manitoba Drilling Incentive Program and accumulates and publishes monthly production and disposal/injection data on all active wells in the Province.

The Section administers Manitoba's oil price supplement programs, namely the New Oil Reference Price (NORP) and Special Old Oil Price (SOOP), with funding from the Federal Government. NORP and SOOP supplements are distributed on a monthly basis to Manitoba producers.

The oil export charge revenue-sharing program allows for the 50/50 sharing with the Federal Government of the tax on oil exports attributable to Manitoba. The Section calculates Manitoba's share of joint Manitoba/Saskatchewan streams according to agreements reached by all parties.

In addition to internal administrative functions, the Section also handles all financial functions of the Branch including the collection of registration, license and subscription fees and technical service charges.

The *Engineering and Geology Section*, located in Winnipeg, administers The Geophysical Regulations, 1982 and The Petroleum Drilling and Production Regulations, 1984. As part of this responsibility, the Engineering component of the Section processes drilling license applications as well as applications to recomplete, suspend or abandon wells. The Engineering component also provides technical support to The Oil and Natural Gas Conservation Board in the processing of applications relating to well spacing, off-target drilling, production allowables, salt water disposal, pressure maintenance, gas conservation, and unitization. In addition, the component conducts technical studies, primarily concerned with oil and gas reserves, enhanced recovery potential, and the hydrocarbon potential of Manitoba. The Geology component of the Section is responsible for the administration of the Geophysical Regulations and for the designation and revision of new and existing field and pool boundaries. This component also provides a consultation service and a source of information for the petroleum industry and the general public.

In performing its duties pursuant to The Mines Act, the Section encourages the maximum economic recovery of Manitoba's petroleum resources with a minimum impact on the environment.

The *Inspection Section*, with district offices in Virden and Waskada, is responsible for enforcement of regulations under The Mines Act relating to geophysical, drilling, production and pipe line operations. Section personnel license and inspect field facilities, investigate complaints, witness specific operations and interpret and communicate departmental or regulatory requirements to industry operating personnel.

The Section also is engaged in research work to evaluate various techniques for reclaiming soil which has been contaminated by oil or salt water spills.

The Petroleum Industry

Crown Oil and Natural Gas Lease Sales

Two Crown oil and natural gas lease sales were held in 1984. One hundred and four leases covering 8 776 hectares were sold for a total of $2,208,639.

In the first lease sale, held on May 9, 1984, the average bonus price paid per hectare was $198.53, whereas in the October 24, 1984 sale, the average bonus price increased to $286.92 per hectare, a new provincial record.

The highest price in the May sale was $790.00 per hectare for an 80 hectare parcel in the Daly area. The highest price in the October sale was a record setting $1,411.17 per hectare for a 128 hectare parcel located in Turtle Mountain Provincial Park.

No exploration reservations were sold in 1984.

Since Crown Oil and gas lease sales resumed in 1979, the Province has received $9,024,913 in revenue from the disposition of Crown oil leases and exploration reservations.

Crown Oil and Natural Gas Leases

As of December 31, 1984, the total area of Crown oil and natural gas rights under disposition was 67 077 hectares. Of this total, 66 053 hectares were held under lease and 1 024 hectares under exploration reservations.

On December 31, 1982, deeper rights renewal provisions came into effect for pre-1979 leases. Under these provisions, non-productive areas and rights below the producing formation revert to the Crown at the end of the lease term. Up to December 31, 1984, these regulatory termination provisions resulted in 9 341 hectares being terminated. The cancelled rights again become available for leasing by other parties interested in actively developing them. A lease may be extended for further periods of one year each if a rental penalty is paid and a commitment to a drilling program is made. In 1984, seven such leases were extended.

Revenue to Freehold Mineral Owners

More than 80% of the mineral rights in southwestern Manitoba are privately owned (freehold), and it is estimated that gross royalties payable to these owners on oil production in 1984 exceeded $18 million (before payment of provincial and federal taxes). In addition there are initial signing bonuses and delay rental payments for new and non-producing leases.

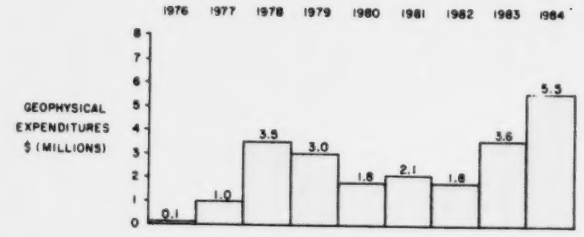
Geophysical Activity

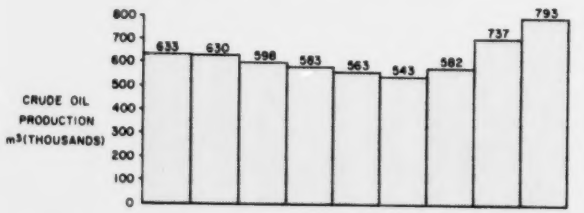
Twenty-three geophysical licenses were issued in 1984. Programs covered 2 731 kilometres, making 1984 one of the most active years for geophysical exploration activity in the Province's history. The cost of these programs was $5.5 million, representing a 53% increase over actual 1983 program expenditures.

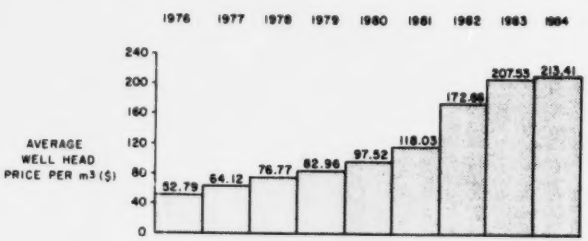
In 1984, geophysical programs were carried out in the following areas of the province: Daly, Tilston, North Tilston, Whitewater, Waskada, Hartney, Oak Lake, Kirkella, Bede, Pierson, Mountainside, Virden, Souris, Napinka, Manson, Plum Lake, St. Lazare, Elkhorn, Lulu Lake, Deloraine, West Butler, McAuley, Hathaway, Regent and Deleau.

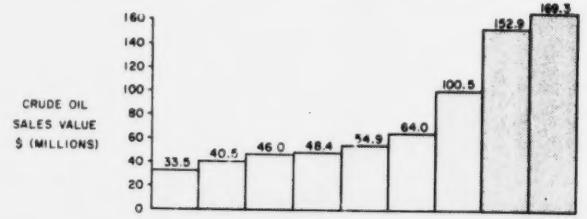
Table 10 indicates those programs licensed in 1984 by licensee and by geophysical operator.

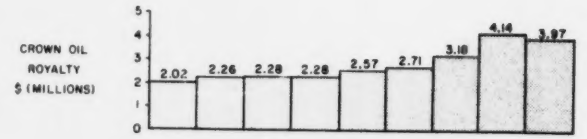
Performance of the Petroleum Sector 1976-1984

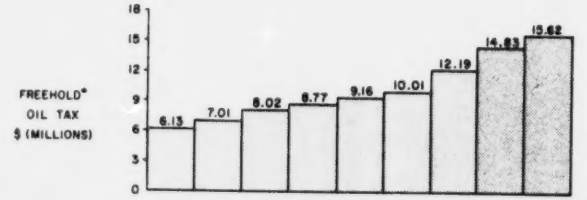












* APPROXIMATELY 80% OF OIL PRODUCTION IS FROM FREEHOLD MINERAL RIGHTS

Drilling Activity

In 1984, 31 different oil companies licensed new wells in Manitoba's oil patch. This represented a 15% increase over the number of companies licensing wells in 1983. Nine drilling contractors with 17 drilling rigs drilled 246 wells, for a total depth of 220 631 metres. Drilling activity in 1984 equalled 1983 levels while surpassing 1982 levels by 26% and 1981 levels by 297%. Of the total number of wells completed in 1984, 210 were classified as development wells, while the remaining 36 were exploratory.

The success rate of wells drilled was also very high. Eighty-nine percent (218 wells) of the 246 wells drilled were completed as potential oil wells. Three oil companies accounted for 54% of all wells drilled: Omega Hydrocarbons Ltd. (72 wells or 29%), Resman Holdings Ltd. (34 wells or 14%) and New Scope Resources Limited (26 wells or 11%).

For the fourth successive year most of the drilling activity in the province took place in the Waskada area (41% or 100 wells). Sixty-four wells were completed in the Daly area while most of the remaining 82 wells were located in the Pierson, Virden, Tilston, Lulu Lake and Whitewater areas.

Table 11 indicates drilling activity during 1984 by operator and by drilling contractor.

Production

Annual oil production in Manitoba reached 793 286 m^3 (5.0 million barrels) in 1984, representing an 8% increase over 1983 and a 36% increase over 1982 production. For the third consecutive year since 1968, oil production increased.

Oil production had been declining at approximately 3.5% per year from 1969 to 1981. The increased oil output since 1981 can be attributed mainly to the continuing development of the Waskada Field and the recent expansion of the Daly Field.

Production from the Waskada Field increased from 240 164 m^3 (1.5 million barrels) in 1983, to 270 156 m^3 (1.7 million barrels) in 1984. As of December, 1984 the average daily production from this Field was approximately 760 m^3 (4,800 barrels).

Production from the Daly Field increased from 67 254 m^3 (423,000 barrels) in 1983 to 88 782 m^3 (558,700 barrels) in 1984, an increase of 32%.

In contrast, production from the Virden Field declined 5% from 375 507 m^3 (2.4 million barrels) in 1983 to 356 897 m^3 (2.2 million barrels) in 1984. This reduction reflects declining reserves not supplemented by additional development.

In 1984, 376 443 m^3 (47% of total production) was classified as "New" oil and of this total, approximately 72% was produced from the Waskada Field.

In December 1984 approximately 53% of the oil production in Manitoba was classified as "Old" oil whereas in 1983 "Old" oil accounted for 60% of total production. This decline in "Old" oil production is expected to continue as more new oil is brought on production.

Table 12 indicates 1984 production by operator and by Field.

Oil Prices

The price of "New" oil (D2S3 quality block) in January, 1984 was \$245.34/m^3 (\$38.99 per barrel). "New" oil prices narrowly fluctuated throughout 1984 reaching a yearly high in August of \$261.82/m^3 (\$41.63 per barrel). "New" oil prices ended the year at \$255.71/m^3 (\$40.66 per barrel).

Compared with 1983, "Old" oil prices remained virtually unchanged. On January 1st, 1984, the selling price of "Old" oil (D3S4 quality block) was \$185.11/m^3 (\$29.43 per barrel) compared with \$184.65/m^3 (\$29.35 per barrel) in January 1983. By December 1984, "Old" oil prices closed the year off at \$185.18/m^3 (\$29.45 per barrel).

Value of Production

The total value of oil production during 1984 was \$169.3 million, an 11% increase over 1983 production and a 68% increase over 1982. The main reasons for the increase were the increased production levels and relatively stable oil prices.

Provincial Revenue from Oil Production

For the third consecutive year Provincial Government revenues from oil production increased due to higher production levels and higher wellhead prices. The Manitoba Government collected approximately \$22.5 million in revenues (\$4.0 million in Crown oil royalties, \$15.6 million in freehold oil taxes, \$2.5 million in Crown lease sales bonuses, rentals and fees, and \$0.4 million in the province's share of crude oil export taxes) resulting in a 4% increase over 1983. These figures do not include provincial revenues in the form of corporate capital tax, sales tax, municipal tax and corporate and individual income tax.

Municipal Tax Assessments

Oil producers in Manitoba pay a municipal tax on wells and associated production facilities, including: oil wells, batteries, salt water disposal wells, salt water disposal plants, water injection wells, and suspended wells.

The municipal tax assessment on these facilities for the period from September 1983 to September 1984 was approximately $6.07 million dollars.

In addition, municipal taxes on flowline and pipeline facilities were assessed at approximately $0.5 million.

Surface Owners

Companies wishing to explore or develop oil properties in Manitoba must negotiate a surface lease with the individual landowner. In return for this right-of-entry, the landowner normally receives a negotiated cash settlement which includes a first-year bonus payment and subsequent annual rental payments for the duration of the lease.

Where the landowner is renting his land to another party, the oil company seeking right-of-entry must obtain the consent of both the landowner and the occupant. After a lease has been signed, the landowner and occupant then determine what each will receive as their respective share of the compensation paid by the oil company.

Following proclamation of The Surface Rights Act on August 9, 1983, disputes relating to right-of-entry are referred to a three member Surface Rights Board. The Board's principal function is to arbitrate disputes between the petroleum industry and landowners regarding use of land for exploration, development and related operations and to determine what compensation should be paid to the landowner. The Board's office is located in Virden. The Board publishes its own annual report.

In 1984, an estimated $2.6 million was paid by oil companies to landowners in the form of first-year bonuses ($1.0 million) and annual rental fees ($1.6 million).

Oil Price Supplement Programs

New Oil Reference Price (NORP) Program:

The Petroleum Branch continued to administer the NORP program in Manitoba during 1984.

As of December 31, 1984, 502 wells were eligible for NORP supplements, an increase of 72% over the 292 wells eligible in December, 1983. In 1984 NORP supplements totalled $23.5 million or 14% of the total value of provincial oil production. Compared with 1983, the value of NORP supplements increased by 31% in 1984.

Special Old Oil Price (SOOP) Program:

The SOOP program continued to operate in Manitoba during 1984 and as of December 31, 1984, production from 26 wells was eligible to receive the Special Old Oil Price supplement. During 1984 a total of $688,500 was paid out in SOOP supplements.

Manitoba Drilling Incentive Program

The "Manitoba Drilling Incentive Program" provides for reduced Crown oil royalty and freehold oil tax rates on oil produced from new wells. Wells drilled between January 1, 1979 and January 1, 1987, and producing from Crown mineral rights, may qualify for a special reduced royalty incentive rate which is 35% of the corresponding base royalty rate charged on "Old" oil. New wells producing from freehold mineral rights are eligible for a corresponding incentive tax rate under The Oil and Natural Gas Tax Act.

The reduced royalty and tax rates apply to production from a new oil well during its respective incentive period. The incentive period earned for wells producing from provincial Crown mineral rights is called the "royalty incentive period" (RIP) whereas wells producing from freehold mineral rights earn a "production incentive period" (PIP).

In 1984 approximately 47% of the 1,350 wells capable of producing oil in the Province were operating under an incentive period (11% under RIP and 89% under PIP). Sixty-two per cent of the 629 incentive wells in the province are located in the Waskada area.

It is estimated that since the program was implemented in 1979, the value of the incentive to industry has been in excess of $7.5 million.

Waskada Gas Plant

A $3.5 million natural gas processing plant, constructed by Omega Hydrocarbons Ltd., in the Waskada Field, was put into operation during March, 1984. The plant, the first of its kind in the province, recovers propane, butane and condensate as by-products from natural gas that is produced in association with crude oil. The plant is designed to process a maximum of 85 000 m^3 of natural gas per day.

Waskada-Cromer Pipe Line

In February 1984, the Minister of Energy and Mines announced that a 90 km (15 cm diameter) crude oil pipe line from Waskada to Cromer, Manitoba would be constructed and operated by Inter City Gas Corporation of Winnipeg. Construction of the $5.0 million line began in October, 1984 and was completed by December 31, 1984. In addition to the 60% interest in the line held by Inter City Gas Corporation, Omega Hydrocarbons Ltd. owns a 30% working interest and the Manitoba Oil and Gas Corporation a 10% working interest.

Oil Reserves

From 1973 to 1980, remaining established oil reserves in Manitoba declined at a rate of approximately 5% per year due to production and lack of new discoveries.

This trend began to reverse in 1980 as new discoveries were made in the Kirkella area. New discoveries in the Waskada area in 1981 further arrested the decline and as a result of additional development in the area in 1982 and 1983, reserves increased. This increase in the Province's remaining established reserves followed more than 16 years of decline.

As of December 31, 1984, the province's total remaining established crude oil reserves were estimated to be 8.02 million m^3 (50 million barrels).

New Regulations

Effective July 21, 1984 three major regulations were introduced covering petroleum industry operations. The new regulations are:

The Petroleum Leasing Regulations, 1984
The Petroleum Crown Royalty Regulations, 1984
The Petroleum Drilling and Production Regulations, 1984

These new Regulations replaced numerous existing regulations, Departmental directives and operational policies.

Oil and Natural Gas Conservation Board

The Oil and Natural Gas Conservation Board is established under provisions of The Mines Act with powers to inquire into all matters relating to the drilling, production, transportation, and distribution of oil and natural gas in Manitoba. The Board conducts hearings and may make orders as specified under The Mines Act.

The Board also processed applications and issued the following Orders:

- Board Order No. 41 authorizing pressure maintenance by a gasflood in the Waskada Unit 4.
- Board Order No. 71A pertaining to maximum permissible rate of production for wells in the Waskada Lower Amaranth Unit No. 2.
- Board Order No. F2-84 designating areas within the Province to be known as Fields.
- Board Order No. P3-84 designating and delineating underground reservoirs within the Province to be known as Pools.
- Board Order No. 72A pertaining to maximum permissible rate of production for wells in the Waskada Unit No. 3.
- Board Order No. 31 authorizing unitization of Waskada Unit No. 4.
- Board Order No. PM42 authorizing pressure maintenance by water flooding in the Waskada Unit No. 5.
- Board Order No. PM43 authorizing a pilot waterflood pressure maintenance project in the Waskada Field (Section 11-2-26 WPM).
- Board Order No. 73A pertaining to maximum permissible rate of production in the Waskada Lower Amaranth Unit No. 1, the Waskada Unit No. 2, the Waskada Unit No. 3 and the Waskada Unit No. 4.
- Board Order No. 74A pertaining to maximum permissible rate of production in the North Virden Scallion Unit No. 1 and the Virden Roselea unit No. 1.

Geological Services Branch

The Geological Services Branch comprises four sections: the Geological Survey Section, the Mineral Investigations Section, the Analytical Laboratory Section and the Editorial and Cartographic Services Section.

The Geological Survey and Mineral Investigations Sections undertake geological mapping, mineral deposit studies and other geoscientific investigations designed to provide an up-to-date geological framework and mineral data base for the Province for use in mineral resource appraisal, land-use planning and in addressing environmental concerns.

The Analytical Laboratory Section provides the necessary analytical support for the Division's geological and mineral evaluation activities. The Editorial and Cartographic Services Section is responsible for the drafting and preparation of all maps, graphs, charts and illustrations for the Mineral Resources Division and the editing of all Branch publications and reports.

Introduction

In April, 1984 Manitoba was the first Province to join with the Federal Government in signing a new 5-year Agreement to assist mineral exploration and development in areas of common concern. Under the terms of the Canada-Manitoba Mineral Development Agreement (MDA), Canada and Manitoba will, over the next five years, spend a total of $24.7 million to implement geological, geochemical and geophysical surveys, research into mining technology development, marketing and other mineral economic studies in order to improve the level and effectiveness of mineral exploration and to investigate potential new developments that could lead to a diversification of the mineral base currently exploited in the Province.

Final approval for Provincial support staffing was received in April, 1984 and following a brisk recruiting program 60 university students were employed and appointed to various projects by the outset of the field season in late May. A total of 5,586 days of student employment and training were provided in support of the summer field surveys and investigations by the Province.

Regional briefings on MDA objectives and program proposals were given to industry geologists at Flin Flon and Lynn Lake (local CIM), and were augmented by field demonstrations and tours in these and other parts of the Province, for the benefit of both industry and Federal Government geologists.

The 1984/85 Workplan for Sector 'A' Geoscientific Activities identified a total of 53 Provincial projects, and 16 projects to be implemented by the Geological Survey of Canada (GSC). Contributions by the GSC (under a new concept of parallel delivery) are intended to complement programs mounted by their provincial counterparts and will be restricted to projects in which the (GSC) has a unique technical or technological expertise. An integral part of the program will be Applied Geoscience Research contributions from universities. During the year several projects were initiated with the Universities of Manitoba, Waterloo, Windsor and Kansas.

Field Programs

Field demonstrations were held once again at the outset of the mapping season in the Flin Flon, Thompson and Lynn Lake regions in order to facilitate coordination and cooperative programming with GSC and university personnel under the MDA, and for the benefit of company geologists in the respective mining districts.

Lynn Lake Area

In this first year of the agreement, heavy emphasis has been placed on assisting the search for new ore deposits in the Lynn Lake and Flin Flon regions and on raising the level of exploration elsewhere in the Province. The Provincial Geological Services Branch mounted a broad range of projects investigating the base and precious metals potential of the Lynn Lake region. Mineral deposit documentation ranged from the LAR deposit on Laurie Lake to gold occurrences on Cartwright Lake. The Agassiz metallotect was the subject of lithogeochemical, biochemical and basal till studies, and can now be traced from Lynn Lake to east of Barrington Lake for a total distance of 60 km. Detailed work in the area of the Fox mine has brought to light the structural controls delimiting the extent of the orebody and these, together with much enhanced stratigraphic and geochemical definition of the mine lithologies, will play a key role in guiding the search for other copper-zinc deposits in the mine area. Several reports on the geology of the region are now close to completion, as are 1:250 000 scale synoptic compilations. The long outstanding need for more isotopic data is being addressed through U-Pb zircon dating programs initiated with the GSC and the University of Kansas as well as continued Rb-Sr work by the University of Manitoba.

Flin Flon

In the Flin Flon region, geological mapping of the Kisseynew metallotect demonstrated considerable alongstrike extensions to the gold-bearing formation on Nokomis Lake as well as the equivalence of this zone to that currently being investigated on Puffy Lake. Documentation of gold and base metal deposits progressed both within the greenstone terrain and on the northern flank of File Lake and led to the inference that the Kisseynew metallotect might have regional extent incorporating the rock hosting gold mineralization at Squall Lake.

Cross Lake

At Cross Lake, mapping north of last year's work identified layered mafic-ultramafic intrusions on the northeastern arm of the lake as well as previously unrecorded occurrences of fragmental felsic volcanic rocks. Geochemical sampling of granitic and pegmatitic bodies in the region was concluded, and assisted in delineation of the vanadium-bearing anorthositic gabbros south of Pipestone Lake.

Bigstone Lake

Detailed mapping was initiated on Bigstone Lake where volcanic units and associated siliceous iron formation appear to have good potential for adjacent mineralization. On Island Lake, mapping encountered extensive carbonatization near Loonfoot Island and confirmed the existence of a pronounced break between the Island Lake Group and underlying locally gold bearing formations of the Hayes River Group. A brief examination of rare-element-enriched pegmatites in the northwestern Superior Province was extended this year by the University of Manitoba, to include examination of the bodies on Red Sucker Lake.

Horseshoe Lake

A brief reconnaissance in the Horseshoe Lake area focussed primarily on the south limb of the volcanics, and recorded siliceous and ferruginous sediments associated with pillowed flows in the vicinity of an INPUT anomaly. Little work has been done in this region and further investigations to evaluate the potential for gold associated with chemical sediments may be warranted in the future.

Southeastern Manitoba

Mineral investigations in Southeastern Manitoba centered in the area east of Bissett and resulted in detail documentation, sampling and mapping of iron formations and associated metallotects north of Wallace and Beresford Lakes. Gold occurrences elsewhere in this region were documented and sampled in detail to investigate possible extensions to known mineralized zones as well as geologically favourable units that might contain significant background gold values.

Repeated attempts to locate chromite occurrences north of Maskwa Lake failed to encounter deposits of any consequence. The association of intrusive and extrusive, possibly comagmatic, anorthositic gabbros and glomeroporphyritic pillowed flows in this region differs markedly from the much more ultramafic association of the Bird River Sill itself. On the Bird River Sill, the platinum metals investigations included a complete slice across the lowermost megadendritic and layered section of the sill and provided additional samples that are also being subjected to major and trace element analysis by NASA geologists as part of a co-operative program in this area.

Industrial Minerals

Industrial minerals programs continued to evaluate the potential of a broad range of commodities including silica sand, building stone, soapstone and chromite. Additional silica samples were collected from the Swan River Formation and the Beausejour area, and newly identified beds of glauconite in the Swan River area mapped and evaluated for extent. A brief reconnaissance of the Flin Flon region was undertaken to investigate reported occurrences of garnet, sillimanite and other industrial minerals that might have development potential and provide for a diversification of the mineral base of this area.

Remote Sensing

Remote sensing studies, conducted in collaboration with the Manitoba Remote Sensing Centre, continued evaluation of satellite imagery in The Pas region as a means of identifying new deposits of sphagnum peat and as a tool for conducting a dependable, systematic and inexpensive province-wide peat inventory. The Canada Centre for Remote Sensing has scheduled a low level airborne imagery program for the Lynn Lake region as a preliminary test for spectral analysis of stressed vegetation that might serve as an indication to buried mineralization.

Drilling Program

Scout drilling of magnetic anomalies south of Cranberry Lakes extended a program initiated in 1982 south of Reed and Wekusko Lakes, and will eventually provide much needed information on the basement that will be used to compile 1:250 000 scale synoptic interpretation of the Precambrian geology lying beneath the Paleozoic cover rocks. Several of the holes drilled this year were cased to basement and used by the GSC to test bore hole I.P., gamma-ray and susceptibility probes.

Magnetic susceptibility measurements were made by the University of Manitoba on a number of diagnostic formations in the Shield immediately north of the Paleozoic limestones to provide yet another control on the assembly of information from the subsurface.

Elsewhere in the province, the Branch's J. K. Smit 300 drill was used successfully to obtain critical information on Paleozoic sequences as part of the Industrial Minerals and Stratigraphic drilling program. Additional holes drilled this year in the Paleozoic sequences provided information needed to ground-truth a seismic profile in Devonian reef structures at Dawson Bay, and for correlation of Ordovician stratigraphy in the Cormorant Lake region, as well as the Silurian near Narcisse. Stratigraphic mapping of shoreline exposures on northern Cormorant and Rocky Lakes encountered buff to red dolomites of the Stone River Formation, whereas at Yawningstone, Mitchell, Ochunipe and Goose Lakes, a similar dolomite has been assigned to the lower part of the Red River Formation. Lake sediment and bottom-water samples were taken on several lakes in the region as part of a pilot study to evaluate the usefulness of this technique as an exploration tool in highly buffered alkaline waters entrapped within limestone sequences.

Drill Core Retrieval

The Exploration Services Section of the Mines Branch is actively engaged in monitoring and supervising the construction of a new core shed at The Pas. In Winnipeg, existing core storage and research facilities at the University of Manitoba and 1521 Brady Road are being expanded and upgraded to house and process samples from all sectors of the mineral industry.

Map Legend

Lynn Lake District

2 Geochronology — Brochet — Big Sand Lake
3 Rubidium-Strontium Geochronology
4 Mineral deposit documentation — Lynn Lake
5 Mineral deposit studies — western Lynn Lake
6 Lar Deposit alteration zone
7 Fox Mine Geology
8 Cartwright Lake gold
9 Agassiz Metallotect Geochemical Studies
10 Till geochemical investigations

Flin Flon District

11 Geological investigations — Flin Flon
12 Kisseynew Project
13 Mineral deposit studies — Snow Lake
14 Mineral occurrence — File Lake area
15 Mineral deposit investigations — Flin Flon area
16 Geochemistry of felsic rocks — Flin Flon
17 Industrial minerals — Flin Flon-Snow Lake district
18 Gold in Kisseynew terrain
19 Magnetic susceptibilities
20 SubPaleozoic drilling south of Flin Flon and Snow Lake

Southeast Manitoba District

21 Wallace Lake Geology
22 U-Pb zircon geochronology investigations — Rice Lake
23 Mineral deposit investigations — Rice Lake
24 Mineral deposit documentation — Bissett area
25 Gatlan gold — Wallace Lake
26 Mineral potential — Horseshoe Lake
27 Bird River chromite

Thompson-Cross Lake District

28 Cross Lake geology
29 Pipestone Lake geology
30 Northeastern Cross Lake geology
31 U-Pb geochronology — Thompson and northwestern Superior Province

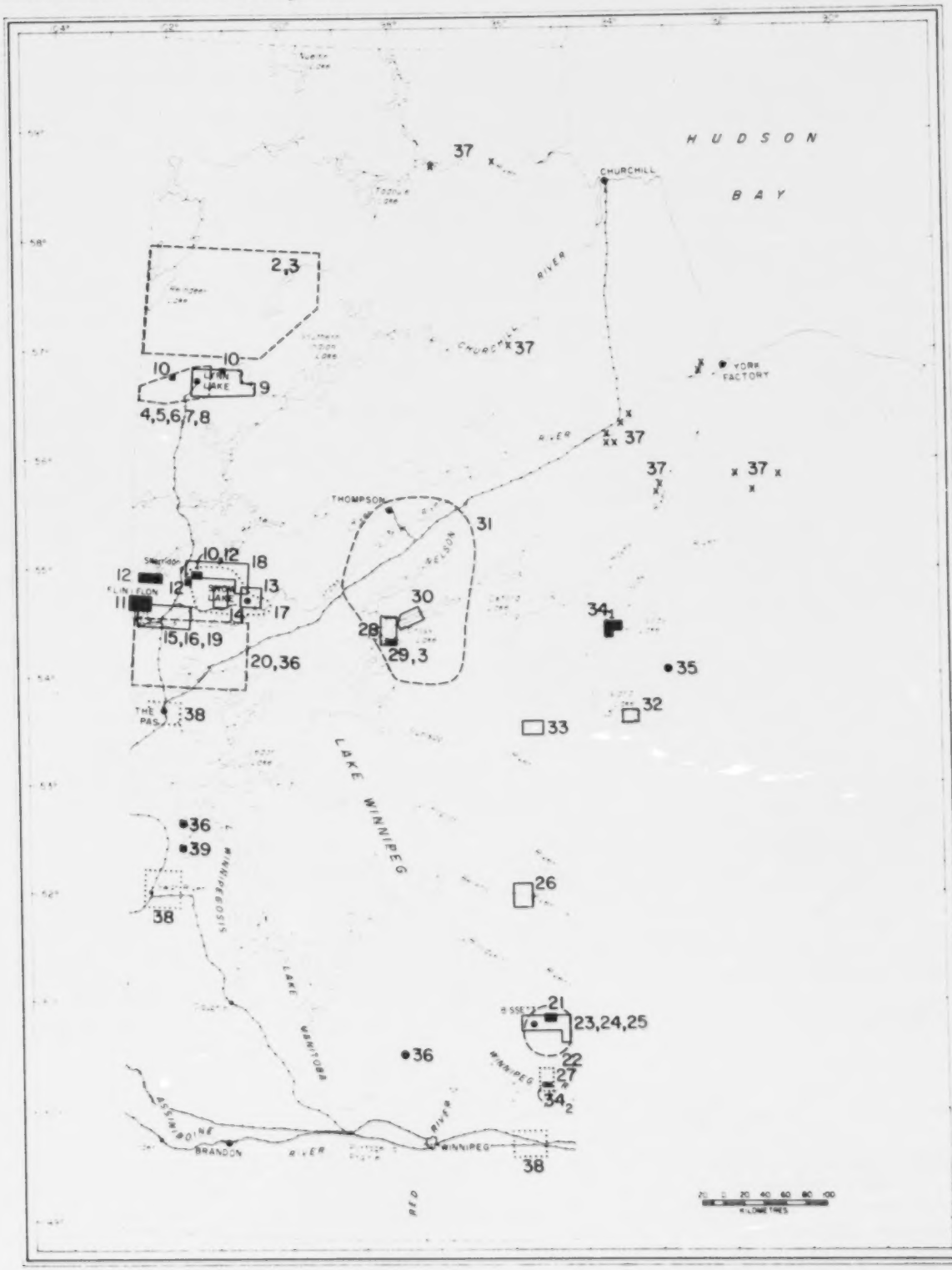
Northwest Superior Province

32 Island Lake geology
33 Bigstone Lake geology
34 1) Gold occurrences — Gods Lake
2) Platinum Group Metals in the Bird River Sill
35 Pegmatitic granites and pegmatites — Red Sucker Lake

Manitoba — General

36 Stratigraphic mapping — core hole program
37 Glacial deposits — Hudson Bay Lowlands
38 Industrial minerals investigations
39 Lead-Zinc potential in southern Manitoba

Map 2
Location of Field Projects



Geological Survey of Canada Programs

Gradiometer surveys mounted in the Lynn Lake area during 1982 and 1983 were extended by the GSC during the year to provide complete coverage for the greenstone terrain from the Saskatchewan border to east of the Ruttan Mine and the Churchill River diversion. Regional lake sediment geochemical surveys, also contracted through the GSC, were extended to encompass NTS sheets 64F, 63G and 64B, thereby completing sampling at a density of 1 per 13 km^2 for the entire block, including 63C which was sampled in 1983. GSC activities in northern Manitoba also entailed mapping surficial deposits in the Lynn Lake area, mineral deposit studies of selected gold occurrences in the Flin Flon region, mineralogical studies of alteration zones in the southeastern Churchill Province, as well as crustal metamorphic studies focussed in the Kisseynew region and adjacent to the Fox mine. U = Pb isotope studies of zircons from the Lynn Lake, Flin Flon and Pikwitonei regions continued this year as did analytical work related to the evaluation of chromite in southeastern Manitoba. Several Applied Geoscience Research Agreements were established between the GSC and Universities in this Province and elsewhere in Canada.

The Geological Survey of Canada Workplan for 1984/85 included five research agreements with the University of Manitoba, as well as research contributions from Queen's University and the University of Toronto. Several of the federally funded projects were displayed at the GSC's public forum held in Ottawa January 22-24, 1985 which was attended by 500 delegates.

Meeting with Industry

The results of the field work were released at the annual Meeting with Industry (223 registrants) on November 14-15, along with a report on Provincial field activities (183 pages), 12 preliminary maps, 2 Open File reports, displays and oral presentations on key components of the year's programs, including presentations from the Geological Survey of Canada and the Department of Earth Sciences, University of Manitoba.

An eight-page questionnaire was distributed to 100 industry delegates at the meeting, to solicit feedback on the appropriateness and focus of the first year's geoscientific program. Twenty-seven responses unanimously endorsed the types of activities being undertaken as well as the emphasis given to the Lynn Lake, Flin Flon and Southeastern Manitoba districts.

Several recommendations for new projects identified in the feedback to the questionnaire and in subsequent discussions with industry personnel have been incorporated into the Workplan for 1985/86, which was subsequently approved by the Federal/Provincial Management Committee on February 26, 1985.

Mineral Exploration Liaison Committee

A Mineral Exploration Liaison Committee, similar to those now operating in other provinces, has been established to facilitate a formal dialogue with industry and to solicit comment on the appropriateness of Sector A initiatives. Invitations for representation were distributed to the Manitoba Mining Association, the Canadian Institute of Mining and Metallurgy — Winnipeg Branch, the Prospectors and Developers Association and the Manitoba and Saskatchewan PDA. On March 28, 1985, copies of the approved Workplan for 1985/86 were sent to these organizations in order to brief them on the work to be undertaken in 1985.

A listing of products and informational releases generated during 1984-85 is provided in Tables 13 and 14. In general, it is apparent that the acceleration and intensification of Federal/Provincial activities under Sector A is achieving the objectives of the Agreement. Industry has endorsed the initiatives in public meetings (Annual Meeting — November 1984, Prospectors and Developers Association March 1985, local Canadian Institute of Mining and Metallurgy meetings, Geological Survey of Canada forum January 1985), in the responses to the November 1984 questionnaire, and by follow-up of concepts and recommendations stemming from the activities.

Analytical and Geochemical Laboratories

The Analytical and Geochemical Laboratories completed 10,491 silicate determinations and 29,863 geochemical determinations in support of staff geologists and 59 determinations for sulphur and specific gravity for the Petroleum Branch. Four thousand four hundred and sixty-seven (4,467) assay determinations for precious and base metals were made on 1,676 rock samples submitted to the laboratory by staff geologists and prospectors.

A computer software package and hardware modification was developed to enable the laboratory computer to collect data from the automated atomic absorption instrument during multi-element sample analysis, and prepare a final formatted report for geologists, thereby eliminating manual handling of the data and manual report preparation. The package is not available from the instrument manufacturer and has been requested by other laboratories wishing to streamline their own operations.

Editorial and Cartographic Services

Editorial and Cartographic Services supply Geological Services, Mines and Petroleum Branches with support services for the preparation of reports, and drafting services for the entire Department. Liaison is maintained with companies involved in printing the reports.

Publications listed in Table 9 and maps listed in Table 10 were completed. In addition to maps and figures for these reports, several hundred other figures were prepared for reports under development.

A new Atlas Series of the Precambrian Shield in Manitoba, on a scale of 1:250 000, was initiated under the Canada-Manitoba Mineral Development Agreement. Many slides and display materials were prepared for various conferences, especially the Annual Meeting with Industry in November, 1984.

Rock Preparation Laboratory

During the year ending March 31, 1985, the Rock Preparation Laboratory completed 1,596 thin sections, 155 stained slabs and 128 polished slabs. It also prepared 2,763 samples for chemical analysis.

The Rock Preparation Laboratory maintained one Precambrian rock and two petroleum core warehouses. Support was provided for 70 requests from the petroleum industry to review core.

The Rock Preparation Laboratory was also involved in a summertime core hole program in which a total of 15 holes were drilled. Of these, 11 were in Project Cormorant area (south of Flin Flon) and 4 for stratigraphic interpretation.

Financial and Administrative Services Division

The Administrative Services Division provides a broad spectrum of service functions in support of the activities of the entire Department. These support services are mainly in the areas of Finance, Personnel, Operations and Systems. The Division is also responsible for administrative policy development.

Similar services are provided by the Division to the Manitoba Energy Authority, the Limestone Training and Employment Agency and the Manitoba Jobs Fund-Limestone Development Office.

Financial Services Branch

The Financial Services Branch provides a wide range of financial, accounting and budget services to the Department. These include:

- financial planning and estimates preparation
- financial advice to program directors and managers
- expenditure control
- financial reporting
- voucher processing
- disbursement accounting
- revenue accounting
- Treasury Board and Cabinet submission co-ordination

Significant accomplishments in the past year included changes in the Estimates process to provide more input from the political and executive bureaucratic levels to improve the planning process, and the development of a comprehensive departmental procedures document for preparing Cabinet, Treasury Board and Economic Resource Investment Committee submissions.

Personnel, Payroll and Operations Branch

The Personnel, Payroll and Operations Branch provides centralized human resource and operational support services to the Department. These services include:

- classification
- staffing
- employee relations
- compensation
- training and development
- personnel and payroll administration
- affirmative action co-ordination
- word processing
- library and operational support services

A total of 44 positions were reviewed and assessed for classification purposes and a number of positions were staffed at all levels within the organization.

Other achievements of the Branch in the past year included the complete redesign and implementation of a comprehensive employee performance appraisal and development system, the establishment of an Affirmative Action Co-ordinator and the consolidation of the Department's operational support and payroll services under the Branch.

Communications and Community Relations Branch

The role of the Communications and Community Relations Branch is threefold:

— to inform the public about the Department's activities;

— to assist other Branches in their communications tasks; and

— to provide communications services to government agencies reporting to the Minister of Energy and Mines.

Public Information

In its public information role, the Branch maintains a high day-to-day profile with its Energy and Mines Info Centre in Winnipeg. This walk-in information office stocks a wide selection of publications on:

— energy management techniques for homes, businesses and community organizations and institutions;

— Manitoba's energy resources, including hydro-electricity, oil and natural gas;

— Manitoba's mineral resources and mining industry; and

— government energy conservation loan and grant programs.

The Info Centre answers public inquiries received by mail and telephone as well as from visitors to the Centre. Between April 1, 1984 and March 31, 1985, the Centre handled 15,843 inquiries — an increase of more than 5,000 over the previous year. The Centre also does extensive mailings of many Energy and Mines publications.

The community relations role of the Branch involves outreach activities throughout the province. Staff set up 55 multi-media displays over the past year on various topics. These displays combined audio-visual productions with distribution of Departmental publications. Displays were set up at fairs, shopping malls, schools and community group meetings. Approximately one-third were held outside of Winnipeg.

The Branch conducts media relations in conjunction with the central Information Services Branch, issuing news releases and arranging news conferences on Departmental activities.

The public information role of the Branch also involves advertising Departmental programs, particularly in the areas of energy conservation and management. In addition to advertising programs such as Community CHEC, Business CHEC, Home CHEC-Up and CHEC Loan, staff prepared an assortment of brochures and pamphlets to inform the public of Departmental programs.

Support for Other Branches

The Communications and Community Relations Branch supported other Branches in their communications tasks in numerous ways. The Branch assisted the Conservation and Renewable Energy Branch in the information transfer component of the Federal-Provincial Conservation and Renewable Energy Demonstration Agreement, producing nine Reports and two Manuals on energy conservation projects, as well as popular summary sheets on these projects. Staff also assisted in the preparation of booklets showing homeowners how to retrofit for energy conservation. These are scheduled for publication in fiscal year 1985/86.

The Branch aided the Department's minerals and mining-related Branches by reprinting the six publications in the Mineral Education Series. It aided technical staff in revising the series and preparing two new publications for the series. The revised Mineral Education Series will be published in fiscal year 1985/86. Staff also developed and disseminated information on the Canada-Manitoba Mineral Development Agreement.

Support for Reporting Agencies

Agencies reporting to the Minister of Energy and Mines which received the services of the Communications and Community Relations Branch included the Surface Rights Board of Manitoba, the Manitoba Energy Authority, the Manitoba Jobs Fund Limestone Development Office and the Limestone Training and Employment Agency. A variety of public information functions were undertaken for these agencies, including production of five pamphlets. Also, staff developed a series of three booklets for the Manitoba Energy Authority, promoting Manitoba's hydro-electric advantage. These will be published in fiscal year 1985/86.

Energy Division

The Energy Division of the Department of Energy and Mines is responsible for monitoring emerging energy issues and advising the Government on energy matters which have implications for the energy security and well-being of the Province. The Division is active in assessing opportunities for the development of Manitoba's renewable hydro-electric resource as a source of energy for Manitobans and as a source of export revenue. It is also involved in exploring opportunities for electrical energy-intensive industries to locate in Manitoba. The Division is active in developing a comprehensive energy conservation strategy to benefit all sectors of the Manitoba economy. In addition to the aforementioned functions, the Division performs a support role for the Manitoba Energy Authority and the Manitoba Energy Council.

Energy Economics Branch

The Energy Economics Branch functions as a research and analytical service to the departmental executive, the Energy Management Branch and the Manitoba Energy Authority. It also advises the Government on emerging energy issues having implications for the Province.

The Branch develops and recommends positions relative to intra-provincial and extra-provincial energy matters and recommends energy development strategies for policy consideration. It maintains information on the current and future energy market within the Province and in other jurisdictions.

The Branch assesses specific energy-related and resource development projects. Economic and financial analysis of hydro-electric development, potential electricity exports, energy conservation projects, and energy-intensive industries including aluminium smelting and potash was undertaken during the fiscal year. Much of the work was done in support of the Manitoba Energy Authority.

The Branch intervenes in hearings and deliberations of extra-provincial regulatory and advisory bodies such as the National Energy Board as required.

Energy consumption in the Province in the years 1982 to 1984 is given in Tables 15 and 16.

Energy Management Branch

The Energy Management Branch is charged with planning, developing, implementing and monitoring programs and projects to demonstrate and foster energy conservation and the use of renewable and alternative forms of energy. The Branch also is represented on inter-provincial energy sub-committees and is responsible for the implementation of Federal-Provincial energy conservation agreements.

In response to the Branch's mandate to promote energy conservation to the advantage of all sectors of the Manitoba economy, the following programs and projects were undertaken during the fiscal year 1984/85.

Cut Home Energy Costs (C.H.E.C.)

The Cut Home Energy Costs program is designed to encourage the conservation of energy in residential heating. CHEC provides homeowners with a loan up to $1,000 for labour and materials to pay for home energy retrofits. The loan, at an interest rate of 9.5% for a five-year term, is repayable over a maximum of twenty years by monthly installments on the homeowner's hydro bill. CHEC not only promotes energy conservation, but also creates employment in the province's energy retrofit and building trades industries.

For the fiscal year 1984/85, 5,424 loans were disbursed valued at $4,149,600. Funding for the loans is provided by the Manitoba Jobs Fund, while the program is administered by Energy and Mines and delivered by Manitoba Hydro and Winnipeg Hydro.

Home CHEC-Up

In response to a growing need for impartial advice for homeowners wanting to conserve energy the Home CHEC-Up program was announced February 9, 1984. Trained energy advisors visit the homeowners to review energy use in the home and recommend economic energy conservation measures. The homeowner is charged $20.00 for this service and this fee is refunded if any of the recommended conservation measures are undertaken within a year.

Funding was provided by the Manitoba Jobs Fund, while the program is administered by the Department of Energy and Mines and delivered by Manitoba Hydro.

In the fiscal year 1984/85, over 3,500 homes were audited.

Business CHEC and Community CHEC

Cut High Energy Costs is an energy conservation grant program designed to assist Manitoba's small businesses (Business CHEC), and municipalities, institutions and non-profit organizations (Community CHEC), to undertake energy retrofits. One time only,

matching grants of up to $15,000 are provided to participants whose latest one-year energy bills total less than $100,000 but are greater than $5,000.

The cost of the retrofit work up to $30,000 is borne equally by the participant and the CHEC programs. Retrofit costs exceeding $30,000 are the sole responsibility of the participant.

In the fiscal year 90 projects were completed and 20 projects are in progress. Grants and interim payments amounted to $928,764 for work completed in the fiscal year. The program is funded by the Manitoba Jobs Fund and administered by the Department of Energy and Mines.

Manitoba Energy Audit Program

The Energy Audit program had initially been undertaken as a cost-shared Manitoba/Canada program under the original Energy Bus Agreement (1980-82) and the National Energy Audit Program (NEAP 1982-84). With the expiry of the NEAP agreement on March 31, 1984, the programs and equipment came under sole control of Manitoba.

With the use of two energy audit vehicles, complete with computer systems and instrumentation, on-site energy audits were provided to 278 facilities, identifying $3.5 million worth of potential energy savings.

A review of the program by Ernst & Whinney Management Consultants, completed in February 1985, determined that the program was generating $4.00 in reduced energy consumption annually for Manitoba establishments for every dollar spent on the program. These energy savings are a permanent and continuing savings even though the program expenditures are not. Program expenditures for the fiscal year 1984/85 were approximately $341,500.

Community-Based Organizations: Energy Conservation Projects

The objective of this program is to stimulate energy conservation and create employment opportunities for minorities and special interest groups by making grants available to non-governmental organizations active in energy conservation and alternative energy services. By the end of the fiscal year six projects were undertaken under this program: the Kinew Energy Program, the Portage Energy Conservation and Weatherization Office, Age and Opportunity Centre, the Canadian Association of the Mentally Retarded, Winnipeg Core Area Initiative and the Dakota Plains Greenhouse Project.

Funding for the following projects was provided by the Manitoba Jobs Fund and they were administered by the Department of Energy and Mines:

(1) Kinew Housing is a non-profit housing corporation that provides low-cost rental accommodation to native families. The Kinew Energy Program funds upgrading and retrofitting of Kinew's homes to reduce energy bills and thus provides a major savings for their low income tenants. The program also provides training for native people to enhance their job opportunities in the retrofitting and construction industries.

(2) The objective of the Energy Conservation and Weatherization Office is to provide energy conservation and education through personal contacts to the elderly, the handicapped, single parent and low income native people in the Portage la Prairie area. In addition, some remedial work such as weatherstripping doors, caulking windows and insulating crawlspaces was undertaken in the clients' homes.

(3) The Age and Opportunity Centre for senior citizens has established an energy conservation program designed to assist elderly residents to upgrade the energy efficiency of their residences. The program employs an energy coordinator who visits seniors and provides energy advice and assistance on a one-to-one basis. The program began in March, 1984.

(4) The Canadian Association for the Mentally Retarded has established a program designed to assess the energy efficiency of the 46 group homes and 19 vocational centres of the Association as well as to provide some financial assistance for undertaking some energy retrofit work.

(5) Winnipeg Core Area Initiative established an accredited course to train core area high school students in "hands on" energy conservation techniques applicable to the housing industry. The project is aimed at developing employable skills in the emerging area of home conservation technology.

(6) An energy efficient greenhouse was built by the Dakota Plains Indian Band to grow tree seedlings for both the government and private industry as well as to provide employment for native people on the reserve. For this project funding was provided by the Manitoba Jobs Fund; the Department of Energy and Mines monitored energy savings, and in conjunction with the Departments of Natural Resources and Business Development and Tourism, helped administer the project.

Conservation and Renewable Energy Demonstration Agreement (CREDA)

The governments of Canada and Manitoba signed CREDA in May, 1980. The Agreement provides for Federal/Provincial funding on a 50/50 cost shared basis for energy demonstration projects underaken in Manitoba.

The objectives of this Agreement are to develop and demonstrate new technologies which exploit renewable energy resources, to conserve energy and make its use more efficient; to heighten public awareness of the potential of renewable energy and conservation technologies; to create employment in new or existing industries; and to accelerate acceptance and commercialization of demonstrated technologies by presenting the main results through brochures, reports and site visits.

CREDA expenditures in 1984/85 were $2.7 million. This program was to have terminated March 31, 1984, but Canada and Manitoba agreed to extend CREDA to March 31, 1985. To date 44 CREDA projects have been funded.

CREDA projects underway or completed in fiscal 1984/85 are listed in Table 17.

Manitoba Energy Authority

The Manitoba Energy Authority is an agency established by an Act of the Legislature and publishes its own annual report. The MEA has been active in investigating potential extra-provincial markets for Manitoba's electrical energy. It has also been active in encouraging energy-intensive industries to locate in Manitoba. The Department of Energy and Mines has provided staff support in these endeavours.

Manitoba Energy Council

The Manitoba Energy Council is a citizen advisory group appointed by the Minister. The Council consists of a Chairperson, Secretary and eight members. The Council provides the Minister with assessments and recommendations concerning energy policy and conservation programs.

Statistical Supplement 1984/85

Table 1

Energy and Mines Expenditure Summary

Year Ended March 31, 1985

	$ 000's	$ 000's		
			Variance	Explanation
	Actual	Estimate	Inc (Dec)	Number
Administration and Finance				
Minister's Salary	18.1	19.6	(1.5)	
Executive Support	289.2	270.1	19.1	
Communications	162.0	236.5	(74.5)	1
Financial and Administrative Services	514.7	532.2	(17.5)	
TOTAL	984.0	1,058.4	(74.4)	
Energy				
Energy Economics	497.7	576.5	(78.8)	
Provincial Energy Programs	409.1	462.2	(53.1)	
Canada/Manitoba Energy Agreement	1,132.0	1,680.8	(548.8)	2
Canada/Manitoba National Energy Audit Program	341.5	364.9	(23.4)	
Cut Home Energy Costs (CHEC)*	658.9	623.7	35.2	
Manitoba Energy Council	26.5	35.0	(8.5)	3
Manitoba Energy Authority**	249.8	250.0	(0.2)	
Canada/Manitoba ERDA Hydrogen Study	28.6	0.0	28.6	
Rounding Error	0.2		0.2	
TOTAL	3,344.3	3,993.1	(648.8)	
Jobs in Energy Conservation ***				
Mineral Resources				
Mineral Resources Management	215.6	216.7	(1.1)	
Petroleum	676.4	673.4	3.0	
Mines	1,461.7	1,466.1	(4.4)	
Geological Services	1,939.6	1,963.6	(24.0)	
Canada/Manitoba Mineral Development Agreement	1,392.5	2,350.0	(957.5)	4
Surface Rights Board	110.2	146.6	(36.4)	5
TOTAL	5,796.0	6,816.4	(1,020.4)	
Expenditures Related to Capital Assets				
Canada/Manitoba Energy Agreement	1,633.4	2,383.3	(749.9)	2
TOTAL DEPARTMENT	11,757.7	14,251.2	(2,493.5)	

* *CHEC Loans totalling $4,200.0 were funded by the Manitoba Jobs Fund.*

** *$625.0 was advanced under The Loan Act, 1984 and $623.4 was spent for a total of $873.2.*

*** *$2,929.5 for energy conservation programs was provided by the Manitoba Jobs Fund.*

Explanation of Major Variances

1. Major programming reductions in the energy and minerals publications planned, resulting from unplanned staff turnover. Existing/available resources were directed at priority energy programs.
2. Major reductions attributable to incomplete information transfer components of projects arising from the lack of available information writers and projects not completed on schedule due to their capital intensive nature.

   Major capital intensive projects were not completed because of construction delays arising from public sector tendering requirements and the unique/specialized capital equipment requirements for the Enerhosp (425.5) and Enerschool (228.8) projects. Other capital projects totalling 95.6 represented cancelled projects or overestimated project completion costs in 1984/85.
3. Lower than budgeted expenditures reflect the Council's activities as an advisory body and its reliance on existing literature to provide topical advice rather than retaining external services.
4. 1984/85 was the first full year of the Agreement, and the 1984/85 Workplan was not approved until April 1984. Estimates allocations were preliminary only, and to a large extent reflected Sector A, Geoscientific Activities programming, which spent 1,247.5 of the 1,356.0 reported.
5. Decrease in actual operating expenditures reflects the Board's streamlined operation. The Board comprised fewer Members than are authorized, generating a commensurate reduction in expenditures.

Table 2

Revenue from Mining and Quarrying

(to March 31st)

	1983/84	1984/85
Disposition and Fees, Rental, etc.	$ 1,724,526*	$ 917,021
Mining Claim Lease Tax	76,543	76,410
Royalties (from industrial mineral production)	373,230	554,352
The Mining Royalty and Tax Act**	10,012,420	—
The Mining Tax Act***	23,642,233	9,216,867
TOTAL	$35,828,952	$10,764,650

* *Includes rental arrears in the amount of $1,217,517.00 for mining claim leases grouped under O.I.C. 1746/56.*

** *Collection of a royalty under The Mining and Royalty and Tax Act was discontinued after December 31, 1980. The revenue shown represents re-assessments for the period prior to that date.*

*** *The Metallic Minerals Royalty Act was redesignated The Mining Tax Act effective January 1, 1981. Revenue shown includes re-assessments made under the former Act.*

Table 3

Mineral Dispositions in Good Standing

at Calendar Year End 1981 to 1984

	1981			1982			1983			1984		
Mining	**No.**	**Acres**	**Hectares**	**No.**	**Acres**	**Hectares**	**No.**	**Acres**	**Hectares**	**No.**	**Acres**	**Hectares**
Mining Claims	6,875	1,835,039	742 614	6,308	1,705,997	690 392	5,783	1,598,651	646 951	6,029	1,767,552	715 303
Order in Council Leases	4,184	295,000	119 382	4,184	295,000	119 382	4,184	295,000	119 382	4,184	295,000	119 382
Permits	13	723,570	292 818	8	694,463	281 039	6	477,624	193 288	11	867,354	351 006
Explored Area Leases	38	35,513	14 372	38	35,513	14 372	38	35,513	14 372	38	35,430	14 338*
Production Leases	29	31,336	12 681	28	31,296	12 665	27	31,256	12 649	25	31,165	12 612
Miscellaneous Mineral Leases	1	996	403	1	996	403	1	996	403	1	996	403
POTASH												
Permits	1	43,390	17 559	1	33,310	13 480	1	33,310	13 480	1	33,310	13 480
QUARRYING												
Leases	302	23,670	9 579	366	26,178	10 594	368	26,199	10 602	393	28,347	11 472
Exploration Permits	13	2,336	945	9	2,014	815	9	2,014	815	6	1,834	742
Limestone Exploration Permits										2	563	228
PEAT												
Leases	13	6,466	2 617	18	8,225	3 329	18	7,505	3 037	23	9,398	3 803
Exploration Permits	8	4,347	1 759	9	3,087	1 249	4	1,560	631	5	4,399	1 780
TOTAL	11,477	3,001,663	1 214 729	10,970	2,836,079	1 147 720	10,439	2,509,628	1 015 610	10,718	3,075,348	1 244 549

* *Area of Lease reduced*

Table 4

Mineral Dispositions Issued

Each Calendar Year 1981 to 1984

	1981			1982			1983			1984		
Mining	**No.**	**Acres**	**Hectares**	**No.**	**Acres**	**Hectares**	**No.**	**Acres**	**Hectares**	**No.**	**Acres**	**Hectares**
Mining Claims	1,318	553,133	223 845	643	285,908	115 703	891	427,628	173 055	1,112	496,824	201 058
Permits	3	231,944	93 864	5	491,347	198 841	3	308,701	124 927	8	558,653	226 079
Explored Area Leases	1	1,872	758	—	—	—	—	—	—	—	—	—
Production Leases	3	1,383	560	—	—	—	—	—	—	—	—	—
Miscellaneous Mineral Leases	—	—	—	—	—	—	—	—	—	—	—	—
QUARRYING												
Leases	39	1,900	769	76	5,045	2 042	17	739	299	34	2,661	1 077
Exploration Permits	5	439	178	1	1,947	788	—	—	—	—	—	—
Limestone Exploration Permits	—	—	—	—	—	—	—	—	—	2	563	228
Casual Permits	77	—	—	78	—	—	74	—	—	64	—	—
Permissions to Remove	416	—	—	528	—	—	569	—	—	508	—	—
PEAT												
Leases	—	—	—	5	1,759	712	3	242	98	5	1,893	766
Exploration Permits	8	4,347	1 759	3	1,307	529	—	—	—	3	4,199	1 699

Table 5

Comparison of Manitoba Mineral Production and Value

1983 and 1984

	1983 (Jan-Dec)			1984 (Jan-Dec)		
	Quantity (Imperial)	Value ($ 000)	Quantity (Metric)	Quantity (Imperial)	Value ($ 000)	Quantity (Metric)
Metals	(000 lb)		(000 kg)	(000 lb)		(000 kg)
Cadmium	224	311	102	328	720	149
Cobalt	708	5,805	321	961	12,543	436
Copper	148,071	140,325	67 164	148,894	127,781	67 537
Lead	1,146	307	520	1,801	604	817
Nickel	72,265	206,859	32 779	89,677	275,165	40 677
Selenium	99	456	45	157	1,827	71
Tantalum	—	—	—	—	—	—
Tellurium	8	119	4	7	88	3
Zinc	108,043	56,324	49 008	107,705	68,737	48 854
Other	—	—	—	—	292	—
Precious Metals	(000 tr oz)		(000 g)	(000 tr oz)		(000 g)
Gold	71	36,739	2 194	69	32,327	2 154
Platinum Group	31	8,880	965	28	8,473	862
Silver	1,056	14,952	32 858	1,142	12,365	35 519
Total Metals		471,077			540,922	
Industrial Minerals	(000 ton)		(000 tonne)	(000 ton)		(000 tonne)
Clay Products	—	7,350	—	—	7,613	—
Cement	320	31,983	290	370	34,192	336
Gypsum	210	2,231	190	191	1,848	173
Lime	—	4,229	—	—	6,194	—
Peat Moss	60	7,266	54	78	9,837	71
Quartz	225	2,312	204	—	3,038	—
Sand/Gravel	10,923	26,537	9 909	12,889	31,953	11,693
Stone	1,253	5,452	1 137	2,337	11,927	2,120
Total Industrial Minerals		87,360			106,602	
Fuels	(000 bbl)		(000 m^3)	(000 bbl)		(000 m^3)
Petroleum	4,638	152,892	737	4,990	169,296	793
Grand Total		711,329			816,820	

Source: Manitoba Energy and Mines

Table 6

A Comparison of Value of Manitoba Metals, Industrial Minerals, Fuels and Total Mineral Production

From 1973-1984
(Calendar Year)

	($000)			
Year	Metals	Industrial Minerals	Fuels	Total
1973	363,650	38,416	17,148	419,214
1974	413,530	45,556	27,169	486,255
1975	452,236	50,662	31,451	534,349
1976	412,301	69,173	33,557	515,031
1977	446,691	81,597	40,428	568,716
1978	338,123	83,696	45,937	467,756
1979	510,049	94,279	48,403	652,731
1980	664,809	100,814	54,968	820,591
1981	478,636	115,189	64,251	658,076
1982	353,150	96,607	101,065	550,822
1983	471,077	87,360	152,892	711,329
1984	540,922	106,602	169,296	816,820

Table 7

Manitoba Petroleum Statistics

(1975-1984)
(Calendar Year)

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Geophysical Licenses Issued	1	3	2	5	10	11	11	19	14	23
Geophysical Expenditures ($)	106,500	118,308	1,046,220	3,451,370	2,970,734	1,843,438	2,116,854	1,805,512	3,639,692	5,547,086
Drilling Licenses Issued	9	16	21	16	27	29	71	201	284	249
New Wells Drilled	11	16	13	22	25	27	62	195	247	246
New Wells on Production	2	3	7	10	11	18	38	145	187	220
New Wells Abandoned	8	10	2	6	9	9	15	30	24	30
Metres Drilled	8 805	13 515	11 584	18 329	20 537	23 508	61 011	184 291	229 304	220 631
Wells Capable of Production (Dec)	831	821	804	808	811	823	853	1 002	1 160	1 350
Wells Producing (December)	686	688	701	703	705	720	748	869	1 041	1 209
Abandoned Producers	12	24	7	3	4	5	5	11	13	30
Other Wells Abandoned	1	3	1	2	1	0	3	8	5	0
Crude Oil Production (m^3)	701 459	633 322	630 466	598 354	583 377	563 482	542 695	582 283	736 934	793 286
Water Production (m^3)	3 977 222	4 021 932	4 228 083	4 075 178	3 946 337	4 171 051	4 565 210	4 581 786	5 079 609	5 575 632
Total Fluid Production (m^3)	4 678 681	4 655 254	4 858 549	4 673 532	4 529 714	4 734 533	5 107 905	5 163 997	5 816 543	6 368 916
% Water Cut	85	86	87	87	87	88	89	89	87	88
Ave. Oil Production (m^3 per day)	1 922	1 730	1 727	1 639	1 598	1 540	1 487	1 595	2 019	2 173
Total Oil Value	31,452,592	33,532,609	40,457,036	45,953,383	48,403,312	54,948,288	64,054,832	100,537,270	152,349,870	169,296,154
Crown Oil Royalty ($ received)	1,823,361	2,023,828	2,263,015	2,281,355	2,280,162	2,574,515	2,714,733	3,175,625	4,135,497	3,972,225
Freehold Oil Tax ($ received)	6,498,072	6,128,261	7,012,186	8,017,968	8,768,511	9,159,426	10,005,107	12,194,350	14,825,318	15,621,900
Average Oil Price per m^3 ($)	44.86	52.79	64.12	76.77	82.96	97.52	118.03	172.66	207.53	213.41
Reservation Sale Bonuses ($)		(last sale held in 1969)	—	—	40,888	820,345	611,199	—	40,192	—
Lease Sale Bonuses ($)		(last sale held in 1971)	—	—	897,895	1,057,530	1,042,958	1,055,668	1,032,885	2,184,063
Reservation & Lease Rentals & Fees ($)	11,700	10,766	10,237	10,198	49,300	133,686	191,409	235,812	274,088	281,673
Crown Reservation Area (ha)	—	—	—	—	4 736	16 915	22 291	20 947	14 496	1 024
Crown Lease Area (ha)	7 213	6 954	6 759	6 759	22 559	29 519	40 806	45 752	57 462	66 053
Total Crown Area Under Disposition (ha)	7 213	6 954	6 759	6 759	27 295	46 434	63 097	66 699	71 958	67 077
Industry Reported Total Expenditures ($)*	13,900,000	14,600,000	18,900,000	27,900,000	31,000,000	38,300,000	55,200,000	82,600,000	116,500,000	121,600,000

* *Source: Canadian Petroleum Association*

Table 8

Summary of Crude Oil and Salt Water Production — All Fields

	Oil Cum. Prod. Dec. 31/83 m^3	Production 1984 m^3	Total Cum. Prod. m^3	Wells Producing Dec. 1984	Water Cum. Prod. Dec. 31/83 m^3	Production 1984 m^3	Total Cum. Prod. m^3
Daly Field	3 564 666.2	88 782.2	3 653 448.4	185	14 794 154.5	929 619.2	15 723 773.7
Tilston Field	78 138.5	10 988.3	89 126.8	21	488 525.0	13 748.6	502 273.6
Waskada Field	457 763.9	270 155.6	727 919.5	314	404 656.2	404 174.8	808 831.0
Lulu Lake Field	35 556.6	1 767.0	37 323.6	3	158 012.7	10 986.8	168 999.5
Virden Lake	17 540 692.5	356 897.0	17 897 589.5	550	63 348 502.5	3 929 149.1	67 277 651.6
Whitewater Field	80 095.9	14 271.3	94 367.2	15	47 071.2	27 637.2	74 708.4
Pierson Field	263 118.4	19 423.1	282 541.5	43	527 271.3	42 573.5	569 844.8
West Butler Field	29 911.3	501.5	30 412.8	3	6 521.0	10.3	6 531.3
Kirkella Field	194 213.8	12 435.0	206 648.8	36	1 365 445.9	143 493.8	1 508 939.7
Souris Hartney Field	125 010.0	2 787.8	127 797.8	7	221 091.9	14 454.9	235 546.8
Coulter Area	6 102.0	757.5	6 859.5	1	37 857.4	5 138.9	42 996.3
South Pierson Field	11 629.9	5 796.0	17 425.9	10	35 268.7	15 312.4	50 581.1
Other Areas	24 437.0	8 723.9	33 160.9	21	153 250.0	38 285.7	191 535.7
Undesignated Pools	—	—	—	—	5 178.7	1 046.6	6 225.3
PROVINCIAL TOTAL	22 411 336.0	793 286.2	23 204 622.2	1 209	81 592 807.0	5 575 631.8	87 168 438.8

Table 9

Crude Oil Sales; Transporters' Dispositions; Transporters' Deliveries

1984

Producers Disposition Field	Production	Opening Inventory	Adjustments	Closing Inventory	Sales (m^3)	Value of Sales*
Daly	88 805.1	1 215.8	(165.7)	2 586.0	87 269.2	$ 16,051,580
Tilston	10 988.3	286.5	186.9	268.6	11 193.1	2,033,478
Waskada	270 155.6	3 221.6	(314.5)	3 701.7	269 361.0	49,550,622
Lulu Lake	1 767.0	53.3	705.0	111.7	2 413.6	431,749
Virden	356 897.0	3 255.8	265.8	3 685.7	356 732.9	65,914,694
Whitewater	14 271.3	178.0	1 791.5	94.0	16 146.8	2,871,786
Pierson	18 795.9	373.2	(8.1)	429.3	18 731.7	3,413,235
West Butler	501.5	30.0	—	44.6	486.9	88,968
Kirkella	12 435.0	416.4	19.6	460.6	12 410.4	2,074,798
Souris Hartney	2 787.8	93.2	—	105.4	2 775.6	490,062
Coulter Area	757.5	177.8	(566.8)	40.7	327.9	58,986
South Pierson	5 796.0	136.3	(21.1)	209.4	5 701.8	1,040,564
Other Areas	9 328.2	572.2	(1 703.8)	794.0	7 403.1	1,087,415
TOTAL	793,286.2	10 010.6	188.8	12 531.7	790 953.9	$145,107,937

Transporters' Disposition

Opening Inventory (m^3)	
Norcen Pipelines Ltd.	274.9
Interprovincial Pipelines Ltd.	7 833.3
Deliveries to Transporters (m^3) At Cromer, Manitoba	
Manitoba Production	791 490.9
Saskatchewan Production	90 953.7
	890 552.8

Transporters' Deliveries (m^3) To

Province	Location	Refinery	
Ontario:	Bronte	BP	—
	Corunna	Shell	224 162.9
	Corunna	Sunoco	18 420.6
	Nanticoke	Texaco	32 412.4
	Sarnia	Imperial	275 493.1
Quebec:	Montreal	Imperial	—
	Montreal	Petrofina	6 314.1
	Montreal	Shell	131 222.6
	Montreal	Sunoco	40 257.1
	Montreal	Texaco	20 374.0
USA:			
Illinois	Mokena	Union	—
Michigan	Marysville	Sunoco	—
Minnesota	Clearbrook	Koch	90 873.5
Closing Inventory (m^3):			
Norcen Pipelines Ltd.			385.5
Interprovincial Pipelines Ltd.			51 907.8
Adjustment			(1 270.8)
			890 552.8

* *Does not include supplements paid under NORP and SOOP programs.*

Table 10

Summary of 1984 Petroleum Geophysical Programs

Geophysical License No.	Licensee	Operator	Km
217	Petty-Ray Geophysical Geosource Inc.	Petty-Ray Geophysical Geosource Inc.	779.7
218	Omega Hydrocarbons Ltd.	Northern Geophysical (1975) Ltd.	109.0
219	Andex Oil and Gas Ltd.	Regency Resources Ltd.	37.0
220	Peregrine Petroleum Ltd.	Quest Exploration Ltd.	7.9
221	Chevron Geoscience Co./ Petty-Ray Geophysical Inc.	Chevron Geoscience Co.	63.0
222	Cymric Resources Ltd.	Century Geophysical Corporation of Canada	39.0
223	New Scope Resources Ltd.	Century Geophysical Corporation of Canada	36.5
224	Pan Canadian Petroleum Limited	Sonics Exploration Ltd.	81.6
225	Westmin Resources Ltd.	Century Geophysical Corporation of Canada	31.5
226	Coho Resources Ltd.	Enertec Geophysical Services Limited	14.5
227	Saskoil Resources Inc.	Beaver Geophysical Services	130.0
228	Blackrock Energy Ltd.	Curzon Exploration Ltd.	410.0
229	Tundra Oil and Gas	Century Geophysical Corporation of Canada	39.9
230	Lasmo Exploration Ltd.	Beaver Geophysical Services	143.0
231	Beaverhead Resources Ltd.	Beaver Geophysical Services	13.0
232	Andex Oil and Gas Ltd.	Regency Resources Ltd.	16.5
233	New Scope Resources Ltd.	Century Geophysical Corporation of Canada	250.1
234	Gale Resources Ltd.	Gale Resources Ltd.	46.0
235	Petty-Ray Geophysical Geosource Inc.	Petty-Ray Geophysical Geosource Inc.	138.0
236	Columbia Gas Development of Canada Ltd.	Sonics Exploration Ltd.	82.6
237	Tricentrol Oils Limited	Northern Geophysical (1975) Ltd.	201.9
238	Saskoil Resources Inc.	Format Resources Corp.	55.1
239	Westmin Resources Ltd.	Format Resources Corp.	4.8
TOTAL			2 730.6

Table 11

1984 Petroleum Drilling Statistics

No. of Wells Drilled by Operator	
Omega Hydrocarbons Ltd.	72
Resman Holdings Ltd.	34
New Scope Resources Ltd.	26
Beaverhead Resources Ltd.	16
Tundra Oil and Gas	13
Andex Oil and Gas Ltd.	8
Quest Energy Corporation	8
Petro Canada Inc.	7
Rideau Petroleums Ltd.	7
Canada Northwest Energy Ltd.	6
Wildmount Resources Ltd.	6
Chevron Canada Resources Ltd.	5
Columbian Gas Development of Canada Ltd.	5
Lyleton Corporation	4
Lasmo Exploration (Canada) Ltd.	3
Roxy Petroleum Ltd.	3
Sasko Oil and Gas Limited	3
American Eagle Petroleum Ltd.	2
Dome Petroleum Ltd.	2
Kinstar Resources Ltd.	2
Saskoil Resources Inc.	2
Troy Oils Ltd.	2
Voyager Petroleums Ltd.	2
A & B Resources Ltd.	1
Antler River Resources Ltd.	1
Ashlu Exploration Ltd.	1
Condor Petroleums Incorporated	1
Copperhead Oil Co., Ltd.	1
Corvair Oils Ltd.	1
ICG Resources Ltd.	1
KLM Ventures Ltd.	1
TOTAL	246

No of Wells Drilled by Contractor	
Red Arrow Drilling Ltd.	96
Crown Drilling Ltd.	73
Can Am Drilling Ltd.	45
Spartan Drilling Ltd.	11
Atco Drilling Ltd.	5
Concept Drilling Ltd.	5
Simmons Drilling Ltd.	5
Brimstone Drilling Ltd.	3
Custom Drilling Ltd.	3
TOTAL	246

Table 12

1984 Annual Oil Production

By Operator	Vol. (m^3)
Chevron Canada Resources Ltd.	353 974.3
Omega Hydrocarbons Ltd.	213 663.9
New Scope Resources Ltd.	34 016.6
Roxy Petroleum Ltd.	22 260.0
Tundra Oil and Gas	21 054.8
Geocrude Energy Inc.	19 651.4
Samedan Oil of Canada Inc.	12 232.7
Resman Holdings Ltd.	11 751.8
Beaverhead Resources Ltd.	10 583.3
Rideau Petroleums Ltd.	9 354.0
ICG Resources Ltd.	8 580.6
Petro Canada Inc.	8 172.7
Mead Petroleum & Farms Ltd.	5 536.7
Cobra Oil and Gas Corporation	5 426.8
Resman Oil and Gas Ltd.	4 601.2
Canada Northwest Energy Limited	4 586.7
Murphy Oil Company Ltd.	4 488.2
TransCanada Resources Ltd.	4 225.6
Can-Tex Drilling & Exploration Ltd.	3 932.6
Andex Oil Co. Ltd.	3 738.6
Triton Petroleum Limited	3 567.6
Saskoil Resources Ltd.	3 270.3
Canadian Reserve Oil & Gas Ltd.	2 794.5
Suncor Inc.	2 459.1
Sasko Oil and Gas Limited	2 399.7
Koch Exploration Canada Inc.	2 344.8
Texaco Exploration Canada Ltd.	1 852.6
Wildmount Resources Ltd.	1 748.5
Scurry-Rainbow Oil Limited	1 081.0
Teck Corporation Limited	1 026.6
Norcoul Resources Ltd.	1 017.7
Other	7 891.3
TOTAL	793 286.2

By Field	Vol. (m^3)
Virden	356 897
Waskada	270 156
Daly	88 782
Pierson	19 423
Whitewater	14 271
Kirkella	12 435
Tilston	10 988
South Pierson	5 796
Souris Hartney	2 788
Lulu Lake	1 767
Coulter	758
West Butler	502
Other Areas	8 723
TOTAL	793 286

Table 13

List of Publications 1984

Mineral Resources Division

Geological Map AR80-5	Quaternary Geology Map: Southern Manitoba, 62K Riding Mountain — compiled by Aggregate Resources
Geological Map AR80-6	Quaternary Geology Map: Southern Manitoba, 62F Virden — compiled by Aggregate Resources
Geological Map AR80-7	Quaternary Geology Map: Southern Manitoba, 62G Brandon —compiled by Aggregate Resources
Aggregate Report AR84-4	Surficial Geology and Aggregate Resource Inventory of the Rural Municipality of Victoria — by Underwood McLellan Ltd.
Internal Resource Management Reports	Aggregates Resource in the RM of Lac du Bonnet — compiled by C. Jones
	Aggregate Resources in the RM of Tache — compiled by C. Jones
	Aggregate Resources in the Winnipeg River Planning District — compiled by C. Jones
Division Staff	1984 Revised Edition of "A Guide to Legislation Affecting the Mineral Industry of Manitoba"
Geological Report GR80-3	Quaternary Geology and Gravel Resources of the Island Lake-Red Sucker Lake area — compiled by E. Nielsen
Geological Report GR80-2	Systematics and Paleoecology of Upper Ordovician Trilobites from the Selkirk Member of the Red River Formation, Southern Manitoba — by S.R. Westrop and R. Ludvigsen, Department of Geology, University of Toronto
Open File Report OF84-1	Preliminary Results of Biogeochemical Studies in the Lynn Lake Area — compiled by M. A. F. Fedikow
Open File Report OF84-2	Interpretation of Airborne Magnetic Gradiometer Surveys of the Area South of the Flin Flon-Snow Lake Belt — compiled by I. T. Hosain

Table 14

List of Preliminary Geological Maps

	Precambrian Geology	Scale
1984B-1	Bigstone Lake (53E, parts of 12 NW and NE) by K. L. Neale, J. G. Bardsley and R.M. Lemoine	1: 20 000
1984C-1	Uhlman Lake (64B) provisional compilation map by H. V. Zwanzig	1:250 000
1984C-2	Granville Lake (64C) provisional compilation map by H. V. Zwanzig	1:250 000
1984I-1	Loonfoot Island (53E/16SE) by H. P. Gilbert, R. Pertson and B. A. Power	1: 20 000
1984K-1	Lobstick Narrows-Cleunion Lake (parts of 63K/13, 14 and 63N/3, 4) by H. V. Zwanzig and D. Seneshen (supersedes 1983K-1)	1: 20 000
1984K-2	Puffy Lake (parts of 63K/14, 15 and 63 N/2, 3) by H. V. Zwanzig	1: 20 000
1984K-3	Nokomis Lake (part of 63/N2) by H. V. Zwanzig and D. Seneshen	1: 20 000
1984N-1	Northeast Cross Lake (parts of 63-1/11, 12, 13, 14) by J. J. Macek and P. A. Tirschmann	1: 50 000
1984N-2	Southeast Cross Lake-West Pipestone Lake (parts of 63-I/12) by M. T. Corkery, P. G. Lenton and H. D. M. Cameron	1: 20 000
1984N-3	Central Cross Lake (part of 63-I/12) by M. T. Corkery and P. G. Lenton	1: 20 000
1984R-1	Wallace Lake West (part of 52 M/3) by D. Gaboury and W. Weber	1: 20 000
1984R-2	Geology of the Gatlan area, Wallace Lake (part of 52M) by R. Gaba	1: 20 000
	Surficial Geology	
1984MIN	Sand and Gravel Resources of the Rural Municipality of Miniota (parts of 62K/2, 3, 6 and 7) by H. Groom	1: 50 000
1984WAL	Sand and Gravel Resources of the Rural Municipality of Wallace (parts of 62F/14, 15, 62K/2, 3) by P. Berk	1: 50 000
1984-SG	Sand and Gravel Resources within the Southern Portion of the LGD of Grahamdale (parts of 62-0/1 and 62J16) by R. V. Young	1: 50 000

Table 15

Energy Consumption* By Type of Fuel

Manitoba 1982-1984

(terajoules)

Type of Fuel	1982	%	1983	%	1984	%
Refined Petroleum Products	111,152	45.5	106,142	45.2	100,236	42.6
Natural Gas	74,306	30.5	70,163	29.9	74,007	31.4
Electricity	51,350	21.0	53,177	22.6	54,873	23.3
Coal and Coke	2,492	1.0	2,597	1.1	2,767	1.2
L.P.G.'s	4,151	1.7	2,292	1.0	3,089	1.3
Steam	605	0.3	493	0.2	427	0.2
Total	244,056	100.0	234,864	100.0	235,399	100.0

SOURCE: *Statistics Canada, Manitoba Department of Energy and Mines*

** Not adjusted for weather.*

Table 16

Energy Consumption By End Use*

Manitoba 1982-1984

(terajoules)

End-use Sector	1982	1983	1984
Residential/Farm	51,670	47,223	49,240
Commercial	49,431	47,721	47,306
Industrial	36,471	35,842	37,711
Transportation			
Farm Machinery and Equipment**	9,672	14,277	9,267
Road**	52,902	47,833	53,426
Rail	9,056	10,582	10,723
Air	7,559	6,672	6,909
Marine	26	39	18
Sub-Total	216,787	210,189	214,600
Non-Energy Use***	6,137	5,215	3,855
Energy Industry Use Losses and Adjustments	21,132	19,460	16,944
Total	244,056	234,864	235,399

* *Not adjusted for weather.*

** *A substantial part of the change in consumption in 1983 as compared to 1982 and 1984 is a result of a change in reporting practices.*

*** *Refined Petroleum Products such as asphalt and lubricating oils and greases which are used for purposes other than their energy content.*

SOURCE: *Statistics Canada, Manitoba Department of Energy and Mines*

Table 17

Canada/Manitoba Energy Agreement Summary of Expenditures by Project

April 1, 1984 - March 31, 1985

Project	Expenditure*
Vanpooling	$ 635.67
Construct and Monitor a Solar Heated Pool (Deloraine Pool)	32.15
Consulting Services (Manitoba Research Council — Industrial Technology Centre)	446.70
Building Energy Management Course (Red River Community College)	937.43
Propane Fuel Study (MTS)	604.69
Gasohol Fuel Study (MTS)	1,271.63
District Heating Study (City of Winnipeg)	15,811.48
Flora Place Retrofit (MHRC)	1,729.81
Methanol Fuel Test Study	329,177.82
Recover Waste Heat from Refrigeration Compressors (Elm Creek Curling Club)	41.14
Retrofitting of Older Home (Sunshine Country Construction)	730.31
Monitoring an Energy Efficient Cold Storage Building (Westco)	1,415.96
Direct Contact Heat Recuperator (Canada Packers)	3,0[illegible]0.44
Energy Recovery from Dryers (Perth-Whitehall) and Monitoring	3,344.00
Route Optimization Demonstration	879.78
Residential Groundwater Heat Pump (Fredericks)	463.97
Manitoba Rolling Mills Reheat Furnace Energy Recovery	507,604.02
Monitoring of Solar Heaters and Blanket (Vassar Swimming Pool)	4,102.55
Retrofitting of Six Rural Arenas	78,427.39
Westward Park Limited (University of Manitoba)	4,174.74
Small Scale Demonstration Projects	147,259.49
Retrofit 120 Residences — Energy Demonstration	73,821.59
Retrofitting of Four Urban Recreation Centres	178,589.33
Anti Idling Device — Manitoba Trucking Association	22,608.35
Maclean-Hunter Tabloid on CREDA	2,853.00
Rolling River School Division Computer System	4,004.51
Cement Kiln — Flax Shives as a Supplemental Fuel (Genstar)	246.04
Installing and Monitoring a High Capacity Wood Burning Furnace (Erickson Arena)	18,579.50
School Retrofit Program — Enerschool	294,342.02
Oven Exhaust Heat Recovery (Inventronics)	10,259.03
Town Energy Conservation Program (TEAM)	176,249.27
Air to Air Heat Exchangers in Commercial Livestock Barns (Robbco)	9,078.69
Flair Ten Home Demonstration Project	92,161.49
Hospital Retrofit Program (Enerhosp)	393,502.73
Waste Heat Recovery From Refrigeration Compressors (Manco Dairy)	12,684.45
National Technology Transfer CREDA	48,502.36
TOTAL	$2,439,623.53**

* *The amount shown in the Expenditure column for each project relates to the fiscal year 1984/85 and does not include money which might have been spent prior to April 1, 1984.*

** *Not included in this total are $0.3 million in administrative costs.*